

FREEDOM REGAINED.

We always have thoroughly detested the mentality of those scientific periodicals which deemed it proper to introduce politics into their columns. During the war we have repeatedly been offended by the unworthy attitude of the editorial staffs of certain botanical journals of "Greater Germany" who admitted — or possibly even deliberately furthered — perorations stating not only the marvellous achievements of nazi-methods and their amazing usefulness towards the particular field of science covered by the periodical in question, but the faith and the devotion of their persons towards the sacred cause of the nazi-system.

We have, as I say, not exactly admired this mentality in a scientific paper and we will not follow the example. However, too much has happened in the five long and hard years of bloody oppression by ruthless and barbarian enemies, both in Holland and in Indonesia, that this crucial moment in our national history could be passed without any comment even by a stolid and, allegedly, unemotional Hollander. For never more distinctly than in the past five years have we been enabled to state — or state again, as the case may be — how utterly different the Germans are from us, how fundamentally their mentality and their ideals differ from ours.

The older among us remember with some sadness the glorious days before 1914 when Germany had still something to give to the world; the days when German science was leading, if not, perhaps, by its originality and sparkling genius, yet by its tremendous thoroughness and assiduity; the days of Engler, Graebner, Schimper, Wettstein and so many others who contrived to produce splendid and admirable works. Engler and Prantl's "Die Natürlichen Pflanzenfamilien", Engler's "Das Pflanzenreich", Graebner's and Schimper's works on Ecology, Wettstein's "Handbuch der Systematischen Botanik", Engler and Drude's "Die Vegetation der Erde", Karsten and Schenck's "Vegetationsbilder" are characteristic and unrivalled products of that quiet and fruitful period; a period when Germany, her evil qualities still slumbering — though already discernable to a keen observer — still had colonies and a fair chance

to increase her international influence in many fields of human life. That chance has been shattered ever more completely since August 1914. The lamentable downfall of the German nation, the very causes of which seem to lie in the German mentality rather than in the dominance of a certain limited group, has been crowned during the second world war. By their brutal and undignified conduct the Germans have greatly fallen in our esteem. We cannot help feeling that we cannot possibly deal with them, however affable they may be — or seem to be — individually, until they are “speaking our language” — and mean it. I am afraid this will not be effectuated unless their youth have enjoyed a thorough education on sound and human principles — if thereto receptive —, have been taught to understand and to respect the mentality, opinions, ideals and vital necessities of other peoples, have learned to develop their personalities and have abandoned their attitude of contemptuous superiority, so heroically displayed as soon as they are in some way dominating, a feature which really is nothing but a symptom of their moral inferiority. Such is the character of the people under whose humiliating yoke we have sighed well-nigh five years.

Is it to be wondered at that, under these circumstances, even the editor of a purely scientific journal cannot resume his regular duties without having unloaded his mind!

We are free now to do as we like, but we are obliged to like only what is good and righteous. Times of self-sacrifice and restrictions, of unrealisable desires and plans, of want of most of the amenities of life, still lie before us. But we have passed the lowest point in our economic life and, though perhaps at first unpleasantly slow, progress is on the march. A deep and wide breach, however, has been made in part of the bonds of international friendship and relations. The leading generation of to-day will not be able to forget and it will need the rise of a new one to re-establish them. Rules and standards for life in a new world will be resolved on by the conquering nations and it seems probable that for the Germans the question of “to be or not to be” depends upon whether or not they are willing and able to accept these rules. Only if they do and do it willingly and heartily, is there a chance for them to retake the place in the scientific world they occupied before 1914. For, in future still more than in the past, it will not be sufficient to be equivalent in a scientific sense; as well as any other man, the scientist too will be judged as to his human and moral standards, his character, his demeanour and his attitude towards representatives of other peoples, both individually and as a representative of his nation. Let us hope that some time the German intellect, thoroughness and laboriousness will

be wedded to a higher developed personality, modesty, world-mindedness and self-knowledge.

All this applies to Europe and more particularly to Holland. But there is more. There is Indonesia to be liberated from the Japanese. What our compatriots have suffered out there, is still unknown, but it is to be feared that their fate has even been more cruel and hard than ours. Yet, their hardships too will come to an end. We may hope and expect that Holland will do her duty and help to bring about a speedy end to these hardships. We may expect that Holland will duly take part in the liberation and in the reconstruction of economic and cultural life in that part of our empire. As far as Systematic Botany is concerned we will, then, eagerly resume our former relations. More particularly we will, together with our friends in Indonesia, have to mould into a more concrete and definite form the plans for the edition of a modern and complete "Flora of Malaysia", which were drafted just before the war started. To such a work Backer's "Flora van Java" forms a satisfactory introduction. But with the publication of this Flora, which is written in Dutch and is, therefore, mainly intended for "home use", only a simple beginning is made to the payment of an old debt of honour, due to scientists of neighbouring countries, which are, as far as this is concerned, in a more advanced position. Let us hope that Dutch botanists in collaboration with many friends from abroad will be able to accomplish this extensive work, to which the fundaments have been laid in Buitenzorg and in Holland during the last twenty-five years, in a reasonably short time. Meanwhile our heartfelt wishes are extended for the salvation of our Indonesian compatriots. May we soon be reunited for the sake of our joint task, under the wise reign of our beloved Queen.

H. J. LAM

Leiden, May 5th 1945.



SEAL OF LEIDEN UNIVERSITY

THE RIJKSHERBARIUM DURING THE WAR

by

H. J. LAM

(Director).

Now that the war in Europe is over it seems appropriate, before returning to our regular duties, to devote some words to the fate and the activities of our institution during that period. For Dutch readers many particulars may be found in the "*Jaarverslagen*" (Annual Reports); for sister-institutions abroad the following points may be of some interest.

First of all it may be stated with deep gratitude that the National Herbarium of Holland has suffered no severe losses in man or material during the war.

PERSONNEL.

Of the personnel of about 20 people (of which 16 were men) only one (C. Mulder) was in active military service. He took part in the defense of the Waalhaven aerodrome near Rotterdam in May 1940 and resumed his duties after the capitulation. When in June 1943 the release of the prisoners of war was revoked, he refused to go and hiding himself at great personal risk, he joined the Interior Forces.

Two other young men (C. L. Marks and A. K. Groenewegen), equally members of the technical staff, were, in September 1943 and February 1944 respectively, summoned to work in Germany. They equally refused and hid themselves until the end of the war.

Although none of the other members of the personnel committed any heroic deeds, it may be stated with great satisfaction that none of them collaborated in any way with the usurpator. This implied that practically all members between the ages of 17 and 40 could not show themselves in the periods of the raids which were particularly frequent from November 1944 onward. Consequently, the general routine work was greatly slowed down, the more so as economic circumstances grew so extremely difficult that even a leave of about a quarter of the working time, granted since the beginning of December 1944, proved to be insufficient to meet the individual needs regarding the procuring of food and fuel. During the last eight months of the war very little work was done. During the last winter the central heating plant had to be put out of function and the whole of the personnel gathered in two rooms, the director's room and the reading-room, each heated by a stove. However, in the middle of February 1945 all heating was officially prohibited for the sake of the community-kitchens and the bakeries. What with the

lack of electric current, this made things not exactly alluring to night-watchmen and young men hiding in the building. It may be added that an excellent — though cold and draughty — hiding-place was fitted up between the concrete roof and the concrete ceiling of the topmost collection room. This was in critical moments successfully used as a retreat, though fortunately no actual raid on the building has been made. In addition, an inconspicuous basement room was used as a hiding-place for spare metals, instruments, bicycles, precious, radio's and other valuables.

The Director sent in his resignation as a Professor of Botany at the University in the middle of 1942. This action formed part of an almost general movement intended to oppose the purposed nazification of the university, which was founded in 1575 by Prince William of Orange as a stronghold of liberty ("*Praesidium Libertatis*"). The obstruction was successful and the university remained closed. Part of the Professors were imprisoned as hostages as early as 1942 and dismissed without payment; others — among whom the director of the "Rijksherbarium" — could continue their work as leaders of their institutes and received a reduced salary. The last-named group was dismissed in February 1943. Only one professor died in a German concentration camp. All others returned safely and resumed their task immediately after the liberation on May 5th, 1945.

COLLECTIONS.

In order to protect the building and the collections against bomb-splinters the basement floor was provided with sand-bags and wainscotings as early as August and September 1939. In May 1940 and again from September 1944 to the capitulation of the German forces in May 1945 the building was guarded overnight by the personnel. When the front approached our frontiers, it was decided to evacuate the topmost floor and to take some other measures so as to reduce as much as possible the risk of damage to the collections. Thus, in January 1944 all unidentified collections, some parts of the general collection (e.g. such type specimens as could be laid hands upon), the collections received on loan from other herbaria and the most valuable books and manuscripts were transported to those portions of the basement which promised the greatest amount of safety in case of fire or bombardments. Some very valuable books, such as the Rauwolff Herbarium of 1575 and some other invaluable copies were granted abode in the fireproof basement of the Museum of Ethnography. At the end of the war only 5570 herbarium specimens were on loan in foreign countries viz.:

Germany:

| | | |
|------------------|------|-------------------------|
| Stuttgart | 32 | (<i>Begoniaceae</i>) |
| Munich | 59 | (<i>Amarantaceae</i>) |
| Heidelberg | 172 | (<i>Filices</i>) |
| Berlin | 290 | (<i>div.</i>) |
| Breslau | 1316 | (<i>Urticaceae</i>) |

| | |
|---|------|
| France (Paris) | 725 |
| Sweden | 396 |
| Czechoslovakia (Prague) (<i>Fungi</i>) | 226 |
| Rest of Continent (Helsinki 20, Budapest 2, Lwow 20, Zürich 8) | 50 |
| Great Britain (London, Kew) | 59 |
| United States of America | 1512 |
| Buitenzorg (Java) (<i>div.</i>) | 715 |
| Singapore (<i>Myrtaceae</i>) | 18 |
| Total..... | 5570 |

It is practically certain that the specimens in Berlin are to be considered lost on account of the destruction of the herbarium at Dahlem in 1943. What remains of the loans to Breslau, Budapest, Lwow and other places which have greatly suffered by the war — to say nothing about Buitenzorg and Singapore — remains to be seen.

The following statement may give some idea of the internal activities of the institute between 1938—1939 and 1944—1945 (p. 429), which may be elucidated by the following notes:

- (I) The number of specimens mounted rapidly decreased during 1944 on account of the fact that the stock of sheets was almost exhausted and could not be replenished.
- (II) a. The number of specimens lent increased during the war on account of the work on behalf of the "*Flora Neerlandica*" to be published by the Netherland Botanical Society.
- b. The number of specimens borrowed — as a matter of course mostly from other herbaria, both public and private, in Holland — remained fairly high on account of the work on behalf of the "*Flora van Java*" by Dr C. A. Backer c.s. (see underneath).
- (IV) a. The number of plant acquisitions remained fairly high except during the last year, partly on account of the collecting activities of the junior staff members (Lichens, Mosses, Algae), partly as a consequence of war circumstances. The number of acquisitions during 1938—1939 includes the collection Lam & Meeuse from South Africa and Madagascar (2169 nrs) and some important exchange collections from Kew, Honolulu, etc. Those of the following years include gifts of European plants collected by Dutch collectors who, on account of personal difficulties desired to be relieved from the cares of their collections. The more important among these are an historically important collection of 2041 specimens from the "Vereeniging tot Beoefening van Overijsselsch Regt en Geschiedenis" (Society for the Study of Law and History in the Province of Overijssel) at Zwolle, comprising among others specimens from De Gorter (18th century); several collections of Mosses, Lichens and Phanerogams from Europe, presented by Mr W. H. Wachter; a Netherland collection by Mr J. A. V. van Embden of 1555 specimens; several collections of Java plants presented by Dr C.

| Year (Sept. 1st— Aug. 31st) | (I) Number of specimens | | (II) Number of specimens | | (III) Duplicates | | (IV) Acquisitions | | | | (V) Photographs made | |
|-----------------------------------|-------------------------------|---------------------------------------|--------------------------------|-----------------|-------------------------------------|--------------------|------------------------|----------------------------------|--------------|-----------------|----------------------------|---------------|
| | (a) Mounted | (b) Inserted in the collections | (a) Lent | (b) Borrowed | (a) Received for distribution | (b) Distributed | (a) Plant specimens | (b) Icones and Carpologica | (c) Books | (d) Reprints | (a) Negatives | (b) Prints |
| 1938—1939 | 16290 | 14001 | 7702 | 1614 | 37 | 1373 | 8187 | 75 | 31 | 303 | 166 | 450 |
| 1939—1940 | 13947 | 15733 | 3834 | 554 | 609 | 349 | 3258 | 50 | 57 | 238 | 437 | 773 |
| 1940—1941 | 19129 | 1737 | 5626 | 53 | 121 | — | 4621 | 4 | 21 | 3773 | 107 | 195 |
| 1941—1942 | 25849 | 24733 | 7467 | 2412 | 10 | 28 | 3414 | 60 | 19 | 406 | 140 | 290 |
| 1942—1943 | 16997 | 20173 | 8757 | 235 | 27 | some | 4361 | 1330 | 275 | 1475 | 157 | 336 |
| 1943—1944 | 7605 | 5192 | 13269 | 1924 | 579 | some | 5361 | 40 | 172 | 177 | some | some |
| 1944—1945 | 4669 | 1147 | 1368 | — | 13 | — | 677 | — | 5 | 78 | some | some |

- A. Backer; a collection of Netherland Phanerogams by Mr L. B. Holthuis; a collection of Phanerogams from Southern Europe and Holland by Dr C. G. F. H. Bayer (1263 spec.); a small but important collection of Celebes plants by Mr Ch. Monod de Froideville (548 spec.).
- b. The number of Icones acquired during 1942—1943 includes 750 water-colours and drawings of Fungi, Mosses and Hepatics by Mr J. A. V. van Embden, as well as 1071 original water-colours which have served for the "Flora Batavia", presented by Mr Wouter Nijhoff of Messrs Martinus Nijhoff, Ltd.
 - c. The number of book acquisitions increased during the later war years. As the international (German) book market disappeared, it was endeavoured to buy useful and valuable books from private botanists. This was a great success and several botanists presented our library with valuable specimens. The years 1942—1943 include a legacy from Mrs A. Weber—Van Bosse, 1943—1944 a number of books purchased from private botanists.
 - d. The number of reprints in 1940—1941 include a large collection of copies hailing from the estate of the late Dr J. P. Lotsy, those of 1942—1943 comprise a legacy from Mrs A. Weber—van Bosse.
- (V) On account of the lack of electricity during the last year of the war very little photographic work could be done in that period.

In addition to the above-mentioned acquisitions a number of private herbarium-collections and libraries were offered abode on request of their owners for the duration of the war.

STAFF-WORK.

As far as the regular work by staff-members was concerned, this was fairly normally continued during the war, as far as the lack of international contact permitted, except during the last six or eight months of the war when the perpetual strain and the far-reaching daily sorrows of the individual workers — hunting for food and chopping of wood was for many of them their main occupation, theft of property and kidnapping of people their perpetual fear for months and months — proved to be too heavy to allow a sufficient concentration or even enough time.

The lack of international intercourse enabled the staff to carry out several projects of internal reorganisation which in happier and more prosperous times were prevented from being accomplished on account of the overwhelming amount of current duties. Some of these could be completed during the war, of others a start was made in the expectation to continue them after the war (which will only be possible if the staff is considerably extended). Many of them were carried out under the daily supervision of Dr S. J. van Ooststroom. The more important items are:

A. Collections.

1. Rearrangement of the collections of
 - a. Manuscripts.
 - b. Specimina in liquor.
 - c. Carpologica.
 - d. Seeds.
 - e. Teratologica.
 - f. Netherland galls
 - g. Icones.
2. Arrangement of a collection of Personalia.
3. Arrangement of the Collection Weber—van Bosse (*Algae*) by Dr J. Th. Koster.
4. Mounting of about 80,000 herbarium-specimens.
5. Revision of the collection of duplicates in order to prepare them for distribution.
6. Preparation of unidentified collections (Carr — New Guinea, Clements — Borneo and New Guinea, Elbert — Lesser Sunda Islands, Lam & Meeuse — South Africa and Madagascar) to be distributed to specialists.
7. Reparation of damaged specimens (started).
8. Severing historically valuable collections (several pre-Linnean) from the general collection (started).
9. Identification of specimens on account of recent monographs (started).
10. Geographical arrangement of Malaysian specimens within the species (started).
11. Geographical arrangement of Netherland specimens within the species (started).

B. Catalogi.

1. Card index system to wall plates for lectures (systematic).
2. Ditto to reprints and literature-fishes concerning items of current interest.
3. Ditto to specimens in liquor and carpologica (systematic with an index according to numbers).
4. Ditto to the general library (started in 1936).
5. Lists of collections represented in the National Herbarium.
 - a. according to collectors' names.
 - b. geographically arranged.
6. Card index system to recent monographs and keys for determination (started).

C. Publications.

Of the journal "*Blumea*" the following numbers were issued since May 1940:

Vol. III, nr 3 (105 pp.)

Vol. IV, nrs 1—3 (542 pp.)

Suppl. II (Jubilee Vol. to Mrs. A. A. Weber—van Bosse, 118 pp.)

Vol. V, nrs 1—2 (422 pp.).

The manuscript of Vol. V, nr. 3 was ready for the press in the spring of 1944 but was withheld on account of the fact that the German authorities would not permit publication with the majority of the papers in English.

Almost every one of the staff-members contributed to some extent to the completion of Dr C. A. Backer's "Flora van Java". Two staff-members, Mr A. G. L. Adelbert en Dr R. C. Bakhuizen van den Brink were, since April 1942 and December 1943 respectively, full-time assistants to this work, a third, since April 1944, was kindly put at disposal by the Utrecht University Herbarium (Miss Dr G. J. H. Amshoff).

A provisional typescript of this Flora was published as an emergency edition in a limited number of copies. This was started towards the end of 1940. Up to the middle of 1945 seven parts were issued and its completion may be looked forward to in the beginning of 1946. New species, varieties and nomenclatural alterations are separately published in "*Blumea*".

For other activities in this field may be referred to the present number and to the notes regarding the individual workers underneath.

D. General.

In addition to the particulars mentioned under the names of individual staff-members the following points may throw some light upon the general staff-activities of the institute.

The usual staff-meetings were more or less regularly continued during the war. Of these there are two types, domestic business and scientific lectures. The following numbers of meetings were held since May 1940 till the end of the war:

| | 1940 | 1941 | 1942 | 1943 | 1944 | 1945 |
|------------------|------|------|------|------|------|------|
| domestic | 1 | 3 | 2 | 3 | 3 | 2 |
| scientific | 1 | 3 | — | 3 | 8 | 1 |

Botanical inventarisations of some ancient private country seats in the vicinity of Leyden (Oud-Poelgeest, Zuydwijk, Raaphorst) were carried out by some junior members of the staff (R. A. Maas Geesteranus, J. J. Barkman).

E. Individual.

The personal activities of staff-members, apart from their many scattered daily duties, largely appear from their publications, issued and intended. The following lines contain the titles of these publications — as far as they are of a botanical nature and have not been published in "*Blumea*" (the present number inclusive) — together with such remarks as are relative to their activities as far as they are not apparent from these titles. The arrangement is, first of all, according to the rank of the staff-member and is further chronological.

Dr H. J. Lam, director (*Phanerogams*) — Devoted a great part of his time to the preparation of a textbook of special botany, to be edited

by J. Lanjouw (Utrecht), A. A. Pulle (Utrecht) and himself. In this book (written in Dutch), Dr Lam expects to deal with Phytogeography (of which about one half was completed by the middle of 1945), Theoretical Taxonomy, Evolution and Phylogeny. Furthermore preparations were made to a collaboration to three separate Encyclopaediae (in Dutch).

Publications:

- LAM, H. J., Een botanische Studiereis naar Madagascar — Vöordr. reeks Mij. Diligentia 1940, pp. 112—137.
 —, Plantengeografisch beeld van Nederlandsch-Indië — Eenentwintigste Koloniale Vacantie cursus voor Geografen, Amsterdam 1940, pp. 12—20.
 —, The life of Gronovius — Chronica Botanica VI, 2, 1940, 28—30.
 —, Een historisch-plantengeografisch probleem van den Stillen Oceaan — Handel. 28ste Ned. Nat. & Geneesk. Congr. Utrecht 1941.
 —, Trois nouveaux Planchonella de la Nouvelle Guinée avec une note sur Kraussella — Boissiera VII, mars 1943, 91—99.
 —, Hedendaagsche opvattingen over evolutie en phylogenie — Vakbl. voor Biologen 247, 1943, 73—81.
 —, Contemporary opinions concerning Evolution and Phylogenetics — Resumptio Genet. XVI*, 1944, 161—174.

Ready for the press:

- , Flora (in Dutch) — to be published in a monograph of Celebes, to be issued by the "Molukken-Instituut".
 — (with W. K. H. KARSTENS). Plantkunde (in Dutch) — to be published in an edition relative to the scientific work, during the last 25 years accomplished in Holland on behalf of the overseas parts of the empire, prepared by the "Werk-gemeenschap van Wetenschappelijke Organisaties in Nederland".

Dr J. Th. Henrard, Conservator (*Phanerogams*) — Devoted most of his time to the completion of his monograph of the genus *Digitaria* (*Gramineae*), which by now is almost completed and for which the greater part of the text and illustrations are ready for the press. This important work of long years comprises about 90 % of the 300 species; 10 % (30 species) had to be left out. Of these 13 were formerly described by Germans and 4 by an Italian investigator. It is to be feared that the type specimens of all or most of these species (Berlin, Catania) have been destroyed during the war. The remaining 13 species can possibly be studied after the war. On account of the possible destruction of type specimens it is very fortunate that the types of almost all species could be studied, described and pictured.

Dr Henrard furthermore continued the arrangement of the extensive *Gramineae*-collections in the general herbarium and made a start with the study of the grasses of New Guinea and the Lesser Sunda Islands and of the genus *Setaria* (monograph).

Publications:

- HENRARD, J. TH., New Grasses from Suriname — Rec. Trav. Bot. néerl. 39, 1942, 141—146, 3 fig.
 —, Notes on the genus *Bothriochloa* — Gedenkboek J. Valckenier Suringar, 1942, 181—187.
 — (with G. J. H. AMSHOFF), Gramineae in PULLE, Flora of Suriname Vol. I, Part 1, 1943, 273—442.

Ready for the press:

- , Monograph of the genus *Digitaria* — to be published either separately or as a supplement to "Blumea". This typescript of about 800 pages with about 350 figures is practically ready for the press except some few particulars which, on account of the lack of international contact could thusfar not be obtained. This work is subdivided into three parts: A. Introductory and general considerations; B. Critical treatment of the literature, alphabetically arranged; C. Taxonomic subdivision, with keys.

Dr S. J. van Ooststroom, Conservator (*Phanerogams*) — Devoted much of his time to numerous internal reorganisations (see above) and further to the organisation of the "*Flora Neerlandica*", to be edited by the Netherland Botanical Society as a Centenary Publication, for which he also prepared and completed the elaboration of the Pteridophyta. In collaboration with J. G. Sloff, the same was done on behalf of the 2nd Edition of the "*Prodromus Florae Batavae*".

Publications:

- OOSTSTROOM, S. J. VAN (with O. DEGENER), *Ipomoea tuboides* Degener & Van Oostr. — *Flora Hawaiiensis*, Fam. 307, 1940.
- , *Lamium album* L. var. *splendens*, nov. var. — *Ned. Kruidk. Arch.* 50, 1940, 159—161, 1 fig.
- , *Teratologische Aanteekeningen IV* — *Ned. Kruidk. Arch.* 50, 1940, 162—168, 1 fig.
- , *Convolvulus lineatus* L. in Zeeland ontdekt — *De Levende Natuur XLVI*, 1941, 153—155.
- , *Colobanthus spec. en Oenothera contorta* Dougl. in A. W. KLOOS, *Aanwinsten van de Nederlandse Flora in 1940* — *Ned. Kruidk. Arch.* 51, 1941, 109—110 en 114—115.
- , *Het herbarium van David de Gorter* — *Ned. Kruidk. Arch.* 51, 1941, 252—274.
- , *Dr J. J. Smith vijf en zeventig jaar* — *Orchideeën* 9, 1942, 39—43.
- , *Weer een vondst van Proboscidea* — *De Levende Natuur XLVII*, 1942, 123.
- , *Een 17de eeuwsh herbarium uit de omgeving van Danzig* — *Gedenkboek J. Valekenier Suringar*, 1942, 208—217.
- , *Geastrum nanum* Pers. met twee peristomen — *Fungus* 14e jaarg., 1943, 49.
- , *Het geslacht Cuscuta in Nederland* — *Ned. Kruidk. Arch.* 52, 1942, 159—210.
- , *Portulacaceae in PULLE, Flora of Suriname Vol. I, Part 1*, 1943, 486—491.
- , *Ranunculus Cymbalaria* Pursh in A. W. KLOOS Jr., *Aanwinsten van de Nederlandse Flora in 1942* — *Ned. Kruidk. Arch.* 53, 1943, 37—39.
- (with J. TH. KOSTER), *Een nieuwe vorm van Crepis biennis* L. — *Ned. Kruidk. Archief* 53, 1943, 72—74.

Ready for the press:

- , *Lamium album* L. var. *caudatum* nov. var. — to be published in "*Nederlandsch Kruidkundig Archief*".
- , Pteridophyta — to be published in "*Flora neerlandica*". The Pteridophytes of the Netherlands, with particular stress on the taxa subordinate to the species.
- , *Eenige nieuwe combinaties en nieuwe vormen bij Nederlandsche Pteridophyta* — to be published in "*Nederlandsch Kruidkundig Archief*".
- , *Convolvulaceae* — to be published in "*Nova Guinea*".

Dr Josephine Th. Koster, Assistant (*Compositae, Algae*) — Devoted much of her time to the rearrangement and the modernisation of the Herbarium Weber—van Bosse. This task, started in 1934, was completed during the war. Furthermore she assisted Dr Van Ooststroom in some of the internal reorganisations, particularly the rearrangement and the sorting of the duplicate collections. Finally she continued the elaboration of Herzog's Bolivia *Compositae*.

Publications:

KOSTER, J. TH. (with S. J. VAN OOSTSTROOM), Een nieuwe vorm van *Crepis biennis* L. — Ned. Kruidk. Archief 53, 1943, 72—74.

Dr J. S. Zaneveld, Assistant, in September 1942 succeeded by R. A. Maas Geesteranus, Assistant (*Fungi*) — Mr Maas Geesteranus devoted most of his time to a revision of the Netherland Lichens on behalf of his thesis. This work is very nearly completed. He furthermore made numerous collecting trips in all parts of the Netherlands.

Publications:

ZANEVELD, J. S., Nieuwe Nederlandse Myxomycetes en Fungi ontvangen aan het Rijksherbarium gedurende de jaren 1933 tot en met 1939 — Ned. Kruidk. Arch. 50, 1940, 98—104.

—, Lijst van Nederlandse Myxomycetes en Fungi ontvangen aan het Rijksherbarium gedurende de jaren 1933 tot en met 1939 — Med. Ned. Myc. Ver. 25, 1941, 31—60.

—, Het vruchtlichaam van *Polyporus Tuberaster* Jacq. ex Fr. in Nederland gevonden — *Fungus XIII*, no. 1, 1942, 1—5, 2 fig.

—, Some Notes on Charophyta collected in the Netherlands West Indies, North Venezuela and Colombia — *Rec. Trav. bot. néerl.* 38, 1942, 141—146 (*Meded. Bot. Museum en Herbarium Utrecht*, No. 82).

Ready for the press:

MAAS GEESTERANUS, R. A., Revision of the Dutch Lichens I — to be published in "Blumea" (thesis).

A. G. L. Adelbert (since April 1942) and Dr R. C. Bakhuizen van den Brink (since December 1943), temporary assistants (*Phanerogams*) to Dr C. A. Backer, unofficial collaborator — Devoted practically all of their time to the elaboration of natural orders on behalf of the new "*Flora van Java*" (see above and also under Dr C. A. Backer).

Mr Adelbert started a monographical study of the genus *Erycibe* (*Convolvulaceae*) on behalf of his thesis. This work, however, was interrupted on behalf of that on the "*Flora van Java*".

Dr Bakhuizen van den Brink started an elaboration of the *Urticaceae* on behalf of the "*Flora Neerlandica*" as well as an investigation of the diagnoses comprised in various Netherland Indian plant catalogi.

J. J. Barkman, temporary assistant (since July 1943, *Mosses*) — Devoted much of this time to an investigation of the cryptogamic epiphytic associations in the Netherlands. To that purpose he made, in some cases together with R. A. Maas Geesteranus, many collecting trips in several parts of the Netherlands during which also Mosses and Lichens were collected. Of some of these exsiccata were prepared.

Publications:

BARKMAN, J. J., Over eenige vondsten van Nematodengallen op bladmossen — *De Levende Natuur XLVIII*, n. 11, 1944, 137—139.

Ready for the press:

—, Over oecologie en sociologie der cryptogame epiphyten — to be published in "Vakblad voor Biologen".

—, Enige sociologische en plantengeografische opmerkingen over de flora van het Berger bosch — to be published in "Nederlandsch Kruidkundig Archief".

- , Bryologische zwerftochten door Nederland. I. Brabant. — to be published in "Nederlandsch Kruidkundig Archief".
—, Aanvullingen op de mosflora van de omgeving van Alkmaar (with W. MEYER) —
—, Mosgezelschappen aan meeroevers — to be published in "De Levende Natuur".

Dr J. J. Smith, Unofficial Collaborator, formerly, keeper of the Herbarium and Museum for Systematic Botany of the Government Botanic Garden, Buitenzorg, Java.

Publications:

SMITH, J. J., *Dendrobium cymbidioides* Lindl. en zijn naaste verwanten — *Orchideeën* 9, 1942, 44—48.

Ready for the press:

—, *Orchid flora of Java*.

This is an extensive typescript of more than 800 pages. It was ready for the press by the middle of 1941 but permission to be printed could not be obtained from the German authorities on account of the fact that it was written in English. It is a very augmented revision of the former work by the same author: *Die Orchideen von Java*, 1905.

Some progress was made in the picturing of Malay Orchids, for Dr Smith's series "*Icones Orchidacearum malayensium*".

Dr C. A. Backer, Unofficial Collaborator, formerly botanist for the Java flora at the Government Botanic Garden at Buitenzorg, Java and later at the Sugar Experiment Station at Pasoeroean, Java.

Publications:

BACKER, C. A. (with collaborators), *Flora van Java*, Afl. I, II, III, IV A—C, V, 1940—1944, to be continued.

CLASSIFICATION OF THE STRUCTURAL ELEMENTS OF THE SECONDARY WOOD OF DICOTYLEDONS, USING DECIMAL INDICES FOR CLASSIFICATION AND IDENTIFICATION OF WOOD SPECIES

by

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I. INTRODUCTION.

An outline of the development of wood anatomy in the last few years will reveal a general need of a system in which all species of wood

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can be arranged according to their mutual relationship (Record 1931, 1934 b, 1936 a; Chalk 1937), while this classification is to form the basis for the identification.

The desirability of arriving at an internationally standardized method of classification and identification was brought to the fore by Pfeiffer (1932) at the Zurich congress of the International Association of Testing Materials, where he gave an outline of the work done in this field in Holland. The International Association of Wood Anatomists started the investigation of this problem, and a number of preparatory publications — dealing with the terminology of wood description (1933) and the dimensions of a few wood elements (1937 and 1939) — have since been issued. Further, monographs have appeared about the wood structure of numerous plant families, as well as publications concerning the variability of certain anatomical characteristics and their distribution over different systematic botanical units (for an outline, see Record 1936 b). Many of them are from the pen of I. A. W. A. members. At present a number of classification and identification schemes may be found in the literature based on widely divergent principles. A universal system of classification and identification is still lacking, and it is the object of the present paper to suggest a new procedure for such work. Its advantages and disadvantages are compared with those of other authors' methods.

Some investigators have asked themselves whether it would be possible and desirable to set up a general identification table for woods according to families, or whether it would be preferable to make a direct identification of genera and species omitting an arrangement by families. They defend this latter method (among others, Beversluis 1925) on the strength of the fact that each characteristic is found throughout the botanical system and is not confined to only one family. Further, more or less typical group features may vary considerably within the smaller units of that group.

Pfeiffer (1926 b), in his discussion of Beversluis' work, pointed out already that such drawbacks are also met with in morphological systematics, but that combinations of very definite frequently varying features may be characteristic of families. In this connection Thonner's little book (1917) is mentioned, which shows that, in spite of the above difficulties, it is quite possible, to set up a general table of families. Nevertheless, various main sections of his system contain representatives of different families recognized as a botanical unity. It seems therefore quite feasible to compile a corresponding table based on the anatomy of secondary wood.

In connection with the above-mentioned problems Pfeiffer, as early as 1921 worked out a scheme as described under III (see *Tectona* 16, 1923, 1095 and the Yearbook of the Netherlands East Indies Department of Agriculture, Industry and Commerce, 1922, 154—166) for a general classification of dicotyledonous woods using decimal indices, while he also made an identification table for a large number of families.

The hand lens method used here has been fully adapted to the possibility of identification in practice, in the same way as shown in the works of Beekman (1920), Den Berger and Beekman (1922), and

Bienfait and Pfeiffer (1924). As regards reliability this method is hardly inferior to that requiring the use of a microscope and it has, moreover, the advantage that it can be used everywhere, both at laboratory and emporium, in factory, saw-mill or in the forest. It has further been found that field men lacking a preliminary botanical training are capable of mastering this procedure in little time. The system of classification and identification therefore rests exclusively on characteristics which can be observed by means of a hand lens and a hand lens micrometer (Pfeiffer 1926a). Apart from structural features it includes specific gravity, hardness, colour, gloss and smell.

The data were not published because they only formed part of a working programme for a preliminary investigation. The object of this investigation was to find out whether it would prove possible to use such a decimal system in actual practice. This method of classification has since been applied by its author to more than a thousand different species of wood with satisfactory results.

It has meanwhile become evident that the quick — and for practical work important — hand lens identification method has fully succeeded in holding its own beside the microscopic method. For this reason the original working programme as designed by Pfeiffer in 1921* has been mainly left unchanged, and microscopic characteristics have not been added.

The second author has brought the scheme into line with the literature and compared the two. He has further suggested the possibility of applying the microscopic investigations to the decimal classification and identification method as well (see under V.). If a decimal scheme is worked out for microscopical characteristics, the two methods might be used side by side and supplement each other. In this way a classification system might be built up by which all species of wood are arranged in accordance with uniform rules, and which makes it possible to identify these woods both with hand lens and microscope.

The well-known advantages of a decimal system are a quick and mathematically certain classification and identification. A further advantage is the fact that the number of woods included can be continually added to, while the filing of cards in a card-index system in accordance with numerical series (see IV C) makes it very easy to find the data required for identification.

The last advantage is the possibility of collecting the classification numbers for certain botanical genera, generic groups, families or family groups, and ascertaining which sub-group indices they have in common or which are closely related. In this way it is very easy to find the indices of the botanical groups and from them infer the systematical value of the various characteristics, so that the most condensed key can be prepared. It will then be found that the distinctions used in morphology are by no means always the most suitable for systematic purposes.

A drawback of the system suggested is a certain inflexibility, which is not in agreement with the peculiarities of living nature; it is a

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drawback, however, which attends every classification of such matter. Moreover a great difficulty is the correct selection of the group divisions and their subdivisions. It is only by rigorous application of the system by routine and by the criticism of others that the most effective classification will be realized.

II. OUTLINE OF SOME CLASSIFICATION AND IDENTIFICATION SCHEMES TAKEN FROM THE LITERATURE.

In the present discussion we have not aimed at giving a complete outline of all the classification and identification systems, mentioned in the literature.

First of all these schemes are dealt with that are intended to allow of a non integrant classification in which the number of woods can be added to arbitrarily (Pfeiffer 1921, Beversluis 1925, Swain 1927, Bianchi 1931, Clarke 1938).

Second come the schemes that are based on the above elaborated hand lens method (Beekman 1920, Den Berger and Beekman 1922, Pfeiffer 1926 a, Record 1934 a). The descriptions of woods occurring in these publications may be used as the starting point for the practical application of the decimal method.

In the third place such authors are mentioned as have given a more or less complete picture of the microscopic structure of wood. (Moll and Janssonius 1906—1936, Pfeiffer 1917, Perrot 1922, Lecomte 1923, Normand 1934, Record 1934 a, Record and Chattaway 1939). The features described by these authors may form the basis for a decimal arrangement of microscopic characteristics.

A. Dutch schemes of description.

THE SCHEME OF MOLL AND JANSSONIUS (1906).

In the general part of the "Micrographie des Holzes der auf Java vorkommenden Baumarten" Moll gives a scheme for the description of secondary wood. This scheme is based on the work of Sanio (1863), and for the first time describes the structure of wood in accordance with the Linnean method. This makes it necessary to treat of the woods in a fixed order. The various elements are described spatially. The scheme relates to the microscopic structure of wood.

Constituents which do not form part of the secondary xylem as such (e.g. included phloem, and latex elements) are not mentioned in it, although use has been made of these features in the identification tables of vol. VII, while they are also included in the descriptions of woods.

The subject of micrography is divided into cytology, histology and microscopic anatomy.

The chemical composition of wood is discussed so far as the micro-chemical reactions on cell wall material are concerned. The scheme does not include physical features such as specific gravity, gloss, hardness and smell.

We would finally add a few remarks on the way in which the features are arranged in the system. In the description of a certain structure various characteristics of it may be subordinate to each other, which is expressed in their numbering and lettering (see e.g., p. 46, No. 22: parts of a bordered pit). In other cases, however, features of unequal value are arranged together (see e.g., p. 40, Nos. 1—5 incl.). The method of classification used, which is no doubt of great importance to arrive at a fixed order of description, does not seem very much suited to the purpose in view, i.e. to obtain an outline of the distribution and variability of features. To make it possible to set up such a "phylogeny of features" it is not only necessary that the various feature groups should be quickly visualized, but it is also desirable for them to have indices in common. This point is of paramount importance in compiling a general identification table. It is not impossible that if the decimal classification of microscopic features is applied to the work of Moll and Janssonius, a wealth of additional data may appear.

PFEIFFER'S SCHEMES (1917 AND 1926).

Unlike Moll and Janssonius, Pfeiffer used a method of description enabling quick identifications to be made in actual practice. The simple instruments required are a hand lens, a pocket knife and a hand lens micrometer in which the surface area of two or three square centimeters is subdivided in different ways. The use of a compound microscope has been avoided. In principle Moll's method of perspective description has been followed. Further, the topography and the description of elements have been kept separate.

The numerical data about the dimensions of the elements are tabulated; the text of the description only includes the relative dimensions.

This method, which was only briefly indicated in 1917, was greatly extended and improved in "The woods of Surinam" (Pfeiffer 1926a). In connection with the foregoing it is clear that cytological features, such as the pitting of elements, have in most cases not been mentioned, since these are mostly visible only through a compound microscope. (Very important exceptions are the vessel perforations and the structure of the ray cells, which may be described with the aid of a hand lens). As against this, the method includes important features visible to the naked eye, which are not mentioned in Moll's scheme, e.g. specific gravity, gloss, hardness and combustibility. The descriptions moreover include a large number of characteristic chemical reactions.

THE SCHEMES OF BEEKMAN (1920), AND DEN BERGER AND BEEKMAN (1922).

Just like Pfeiffer's schemes of description, those of Beekman and Den Berger and Beekman are directed to quick identification in actual practice. Features that can be observed only through a compound microscope have therefore been omitted. However, a number of physical characteristics have been included (such as specific gravity, hardness, grain, colour, gloss and smell). A few chemical reactions with aqueous

and alcoholic extracts are discussed. Beekman introduced the cutting of radial surfaces as an aid to identification. It has the great advantage that the vessels can be perceived over a large distance. In Beekman's work 78 Preanger woods are described, an identification table being added as well. Den Berger and Beekman give a description of twelve wood samples of which the different structural features can be demonstrated in the smallest possible number of species. Although this work was published at a later date, it may be regarded as an introduction to the former.

THE SCHEME OF BEVERSLUIS (1925).

Beverluis based his method of identification on a number of structural features (altogether 66). About the classification of these features he says on page 44 of his work:

"I did not need to take much trouble in deciding on the order and significance which would have to be assigned to the features from a systematic point of view"

and on page 64:

"the degree of constancy and sharpness, and their probable presence decided the priority".

In ascertaining the order which has been chosen it strikes one that features relating to vessels, rays, parenchyma and libriform fibres are described in different places in the system. This will cause no end of trouble when afterwards conclusions of the various features about the distribution and variability must be drawn from the descriptions. Unlike this method, the decimal classification followed by us has the great advantage that if certain features have a factor in common, e.g. that all of them are related to the vessels, this fact is also shown in the arrangement.

For a detailed discussion of this work we refer to the criticism by Pfeiffer (1926 b) and Den Berger (1926), from which it is sufficiently clear that Beverluis' scheme must be considered unsuitable to serve as a basis for a general system of classification.

THE SCHEME OF BIANCHI (1931).

In this identification method use is made of a card divided into squares and bearing the names of the woods to be examined. The card is manifolded (e.g. printed). A small number of cards is printed on red paper, the rest on white. For each feature of identification a white card is reserved. This feature is written on top of the card; the squares of all species showing this feature are marked and carefully cut out.

In this system a red card is used as a basis. If a white card is placed on top of it, the names of the species presenting the feature in question remain visible. If a second white card is placed on the preceding one, the names of the species showing both the features remain visible.

If more cards are added, the number of red squares decreases continually, until finally one remains bearing the name of the species desired.

The advantages of the method are:

- 1) No use need be made of features which cannot be determined with certainty.
- 2) Particular features may be employed which quickly lead to identification, but which are preferably not included in an ordinary table in the beginning so as to prevent mistakes.
- 3) It offers the possibility of combining groups of features, e.g. anatomical characteristics with morphological and chemical features or with data about the geographical distribution.

Some disadvantages of the system are:

- 1) The way to be followed is shown in a table, while it will sometimes be difficult to see from the card-index system which feature is to be used first.

In order to meet this drawback Bianchi suggests the preparation of a supplementary card-index system in which each species has a separate card with squares relating to definite features. If, in course of the identification, one wants to know which feature is to be used, the cards of all the species which still enter into consideration are placed on one another, whereupon it is at once clear which features may be left out.

- 2) The cost of manifolding is high.
- 3) A drawback not mentioned by Bianchi and which may render his system somewhat unsuitable for the preparation of a universal identification table, is the fact that the number of species that can be included is determined by the dimensions of the cards. Bianchi had 720 squares available, 522 of which were used. The size of the cards was 28 by 42 cm. (11 by 16.5 in.)

An outline of the features used in the identification is not given.

B. Anglosaxon schemes of description.

THE SCHEME OF SWAIN (1927)

An identification system in which 200.000 species of wood can be classed has been described by Swain. It chiefly includes hardwoods because the identification of coniferous woods requires the observation of microscopic features, which have been omitted in the scheme. In this case also identification takes place by means of a hand lens. It has not been attempted to link up the system with the "present pseudo-natural botanical system". Some twenty primary groups have been compiled, including species with vessels, without vessels and without rays (?). These groups are subdivided into sections according to weight and porosity, where the following woods are distinguished (p. 736).

| | | |
|-----------------------|---------------|---------------------|
| coarsely porous woods | | very light woods |
| finely porous woods | combined with | medium weight woods |
| minutely porous woods | | heavy woods |
| non-porous woods | | very heavy woods |

The twenty primary groups are further classified according to features arranged in five decimal schemes. A striking fact is that the physical features bulk large in the classifications; thus specific gravity, colour, smell, taste ash and cleavability are often mentioned before important structural features are given.

THE SCHEME OF RECORD (1934).

In the introduction attention was already called to the "Glossary of terms used in describing woods", prepared under the auspices of the I. A. W. A. As this glossary was concise and not illustrated, Record (1934 a), in his work "Identification of the timbers of temperate North America", worked out the definitions and showed their practical application. The identification table includes both a number of economically important coniferous and hardwood species. Like the decimal classification used by us, the main division is based on features which may be observed without the aid of — or with simple — specially adopted means (hand lens method). Features that are only visible under a compound microscope come second, and are indicated with small letters. The classification is artificial as compared with the natural relationship between the species described. The arrangement is such, however, that species greatly resembling each other in appearance, properties and use, are united.

Not only structural features, but also physical characteristics are made use of. The features described in the general part have not been correlated with each other by means of letters or figures, such as would be desirable for the purpose we have in view. Record's scheme may, however, be important as an aid in drawing up a decimal classification of microscopic features.

THE SCHEME OF CLARKE (1938).

The non-integrand identification system of Clarke is based on Bianchi's (*loc. cit.*) and is worked out in the way suggested by Record (1932). Each species of wood contained in the system has its own card: along its margin there are a series of perforation each of which corresponds to an identification feature. If a wood presents a certain feature, the appurtenant hole is made to run on as far as the margin. In the case of missing features the holes do not run on. If a bar is stuck through a hole in the complete set of cards corresponding to a particular feature, the cards showing this feature drop down on shuffling. This operation is repeated until one card is left bearing the name of the species required. The features included in the accompanying scheme relate both to the structure as it can be observed by hand lens and microscope, and to physical characteristics. The geographical distribution is also mentioned as a feature. The total number of features that can be used (88) is limited, however, by the dimensions of the cards.

It may be a drawback in this system that the holes which do not run on are subject to wear, as a result of which all the cards tend to drop down in the long run if they are shuffled. This drawback appeared

when a similar system was used for a different purpose, viz. the classification of literature data.

THE SCHEME OF RECORD AND CHATTAWAY (1939).

A list of 115 anatomical features has been drawn up by Record and Chattaway. This list is more extensive than Clarke's and is intended to be employed with a perforated card index system. Physical and geographical features are not included. The authors have numbered the features consecutively, which is the only possible method to be followed in their identification card system. Yet they apparently felt the need of bringing to expression in the list whether features are subordinate to each other. This purpose has been fulfilled only by means of a particular arrangement (indentation) relative to the marginal line, not by numbering. As a result, common indices of features are lacking, just as in all the other schemes mentioned above.

C. French schemes of description.

THE SCHEME OF PERROT (1921—1922).

In the description of woods Perrot makes use of loose cards on which microscopical features are noted. In order to facilitate the application of this method in actual practice, the number of features is kept small. Not only the structure, but also physical properties are described, while in each case semi-schematical drawings of the transverse and tangential surfaces, magnified 50 diameters, are added. This scheme must be considered unsuccessful because the wood elements are not described three-dimensionally, but are separately noted on the transverse and tangential surfaces. The cards that are used refer to woods of Madagascar, The Ivory Coast and Gabun. An identification system is entirely lacking; the cards each of which represents one species are numbered consecutively.

THE SCHEME OF LECOMTE (1923).

In his little book "Les bois coloniaux" Lecomte gives a brief outline of the structure of wood. The various features are arranged in groups, but are hardly provided with numbers or letters. They are elucidated by means of fine pictures, and each feature is illustrated by reference to a number of woods. This general part is followed by a survey of the principal colonial species in which a numerical classification is suggested for the benefit of the trade.

"Si les exploitants, les commerçants et les praticiens se refusent "absolument à adopter les noms appartenant à la nomenclature "botanique, du moins pourrait-on à la rigueur en s'inspirant des "principes de la classification décimale — préconisée par quelques- "uns, en bibliographie par exemple — adopter une numérotation qui "se substituerait avec avantage à une série de noms dépourvus de "toute signification" (page 86).

"Dans la réalité, elle ne serait qu'une forme nouvelle donnée à la "classification botanique. Et si elle était adoptée par les pays

“étrangers, elle permettrait à l'acheteur de bois de toute provenance
“de connaître sans difficulté la nature de ceux qui lui sont offerts”
(page 87).

The method of numbering is indicated, but has not been worked out.

This idea has meanwhile been realized. Van Heurn (1944), in agreement with the divisions of the “International Committee for Universal Classification” has drawn up a list in which a few thousand numbered woods are classified according to family. (The range 674.03 of the U. D. C.).

THE SCHEME OF NORMAND (1934).

Normand gives a scheme of description based on data taken from French, Dutch, English and American publications. Nevertheless, this scheme, which contains many interesting particulars, has remained very concise. The author himself says: “il permet la rédaction de descriptions d'importance moyenne”. Considering the practical applicability of the scheme, microscopic features have been made use of as little as possible. The terminology is in agreement with that of the I. A. W. A. The feature groups are numbered, but not their subdivisions. A bibliography is added dealing with the examination of wood in general.

III. THE CLASSIFICATION OF STRUCTURAL ELEMENTS USING DECIMAL INDICES.

This chapter contains 20 tables in which a more detailed description is given of the various subdivisions of the groups indicated by letters and figures.

In delimiting the various groups of dimensions the standard terms of the I. A. W. A. are used. Likewise, the definitions and descriptions given by the I. A. W. A. are mostly employed unchanged in our classification. As to the divisions that are not internationally normalized we have followed the detailed descriptions of Den Berger and Beekman (1922) given in Communication VII of the Experiment station for Forestry at Buitenzorg (Java). As far as possible the features have been arranged according to systematic and genetic principles.

Altogether 20 groups are used, each of which is provided with 10 different indices (1—10). Thus 100 trillion (Amer. 100 quintillion) indications are available.

Depending on the formations to which they relate, the 20 groups are combined into 5 sections, and further subdivided into 2 to 5 subgroups, which latter indicate differences between features that are more important in identification and classification than the differences indicated by the various indices in one and the same group.

The main utility of these subgroups is that they render the whole system more flexible, thereby allowing of a better agreement with the classification by the botanical system.

The classes and groups are arranged as follows:

| | | | |
|--------------------------|---|--|--------|
| Section | | | |
| I. Vessels | { | Group A. Perforation plate | p. 447 |
| | | Group B. Grouping of the vessels | " 449 |
| | | Group C. Arrangement of the vessels or vessel groups | " 450 |
| | | Group D. Size and number | " 452 |
| II. Rays | { | Group A. Types and structure | " 453 |
| | | Group B. Number and ratio between the numbers of both types | " 455 |
| | | Group C. Width and ratio between the widths of both types | " 456 |
| | | Group D. Height | " 457 |
| III. Parenchyma | { | Group A. Paratracheal | " 461 |
| | | Group B. Definitely arranged | " 462 |
| | | Group C. Indefinitely arranged | " 464 |
| | | Group D. Quantity | " 465 |
| IV. Particular growths | { | Group A. Included phloem and oil cells | " 466 |
| | | Group B. Resin canals, gum ducts and latex elements | " 466 |
| | | Group C. Storied structure, radial intercellular canals, pith flecks and bast fibre formations | " 467 |
| | | Group D. Growth rings | " 469 |
| V. Other characteristics | { | Group A. Specific gravity | " 470 |
| | | Group B. Cutting hardness and grain | " 471 |
| | | Group C. Colour | " 471 |
| | | Group D. Gloss and smell | " 472 |

Section I. Vessels.

Section I. Vessels. Group A. Perforation plate.

| Sub-groups | Index | Description |
|------------|-------|--|
| a | 1 | vessels are lacking |
| b | | all or most perforation plates are cribriform |
| | 2 | all perforation plates cribriform |
| | 3 | most perforation plates cribriform, the others scalariform |
| | 4 | most perforation plates cribriform, the others simple |
| c | | all or most perforation plates scalariform |
| | 5 | most perforation plates scalariform, the others cribriform |

Section I. Vessels. Group A. Perforation plate (continued).

| Sub-groups | Index | Description |
|------------|-------|---|
| d | 6 | all perforation plates scalariform |
| | 7 | most perforation plates scalariform, the others simple |
| | | all or most perforations simple |
| | 8 | most perforations simple, the others perforation plates, cribriform |
| | 9 | most perforations simple, the other perforation plates scalariform |
| | 0 | all perforations simple |

This classification according to type of perforation plate, which must be regarded as one of the principle features from a systematic point of view, does not by any means satisfy all the requirements.

The delimitation of the four subgroups according to the three typical means of perforations is not sharp, except, of course, in subgroup a.

It will sometimes be difficult to find out whether a particular wood belongs to c 7 or to group d 9, and there are many genera (*Vaccinium* spp. and *Glochidion* spp.) representatives of which belong to both subgroups and exhibit all transitional forms.

Another subgrouping, e.g. b all perforation plates cribriform, c all perforation plates scalariform, d all or most perforations simple, might have been sharper, but, as far as can be judged at present, it is less correct from a systematic point of view.

It is often very difficult to determine whether one or another type of perforation predominates, because the various kinds of perforation strike the eye very unequally. In the case of doubt, or if there is a great chance of mistakes being made, both subgroups or indices are used.

Perforation plate the middle part of which is scalariform and where the bottom and top ends of the oblique plate are cribriform, are all regarded as cribriform (*Platea* fam. *Icacinaceae*).

Plates the perforations of which are arranged in a circle are considered scalariform if the bars of the wheel-like plate can be distinctly and sharply perceived as slender rods. If, however, the perforations consist of round openings and this typical radial structure is absent, the plates are looked upon as cribriform.

Often the perforation plates are so fine that they are invisible under a lens with a magnifying power of 10 diameters. If the radial surface receives incident light, the scalariform perforation plates with many bars show a peculiar grey coloration, which changes if the object is moved in a certain direction. Moreover, these plates are mostly very much inclined, the more horizontal ones usually having few and clearly perceivable bars. This latter observation has already been made, among others, by Frost

(1930 and 1931). The factors determining the axial height of the plates have been analysed by Chalk and Chattaway (1935).

The cribriform perforation plates are usually almost perpendicular to the axial direction or make only an obtuse angle with it; they are generally plainly visible therefore on the cross-section.

If the perforations are so fine that they are invisible under a hand lens, they show a grey discoloration similar to that of the scalariform perforation plates, but in this case without any effect of a particular angle of incidence of the light.

As the fully closed perforation plates (i.e. those only provided with pits or bordered pits) are very rare in secondary wood, they may in most cases be taken to be cribriform if various almost horizontally placed seemingly imperforate plates are observed.

An outline of the different types of perforation plates and a comprehensive bibliography on this subject has been given by Chalk (1933 and 1937). Record (1936 b) has drawn up lists of families characterized by a special type of perforation plates.

Section I. Vessels. Group B. Grouping of the vessels.

| Sub-groups | Index | Description |
|------------|-------|---|
| a | 1 | vessels are lacking |
| b | | most or nearly all vessels solitary |
| | 2 | nearly all vessels solitary |
| | 3 | most vessels solitary, the others in groups of 2—4 |
| | 4 | most vessels solitary, the others in groups of 2-many |
| c | | most or nearly all vessels in groups |
| | 5 | most vessels in groups of 2—4, without distinct radial arrangement |
| | 6 | most vessels in groups of 2-many, without distinct radial arrangement |
| | 7 | nearly all vessels in groups, but without distinct radial arrangement |
| | 8 | most vessels in groups of 2—4, with pronounced radial arrangement |
| | 9 | most vessels in groups of 2-many, with pronounced radial arrangement |
| | 0 | nearly all vessels in groups with pronounced radial arrangement |

In cases that the vessels are not absent, the subgroups are delimited on the one hand by b "most or nearly all vessels solitary", and on the other hand by c "most or nearly all vessels in groups".

This subdivision was chosen because the distinction "most vessels solitary", as against "most vessels in groups" is of relatively great systematic value, while the distinction "nearly all or most vessels with pronounced radial arrangement" as against the groups of 2—4 or 2—10, however important from a systematic point of view, may yet be observed in comparatively closely related species.

The distinction between the vessel groups that are and those that are not in clearly radial arrangement was originally included as a subdivision, but afterwards only expressed in the indices, because, however important this separation may be systematically, the demarcation of the two groups is very indefinite and it would therefore be required to include both groups so often that the classification in the card-index system would be unnecessarily complicated.

Typically radial groups may be observed, among others, in the *Ebenaceae* and the *Sapotaceae*; groups in which the typically radial arrangement is absent are formed in *Erethia longiflora* (fam. *Borraginaceae*) and *Aralia spinosa* (fam. *Araliaceae*). These latter groups are more frequent in woods from temperate zones.

The drawing of the border lines, just as the determination whether the groups are in the majority or not, must take place arbitrarily. In cases of doubt, or when both formations are observed locally over a fairly large surface area of the transverse section (a few sq.cm), two cards are made.

It must likewise be arbitrarily decided whether the wood vessels are arranged in groups of 2—4 or 2-many. This should not be determined according to whether a group of more than 4 vessels is somewhere to be found, but whether such groups occur regularly, be it scarcely. To give an idea, we would suggest that each two sq.cm. should contain one such group. For the purpose of this classification, only the groups of normal vessels are to be taken into consideration, and not the radial groups or clusters of vessels or vascular tracheids, which are much smaller than the ordinary vessels and mostly of somewhat different shape.

Section I. Vessels. Group C. Arrangement of vessels or vessel groups.

| Sub-groups | Index | Description |
|------------|-------|--|
| a | 1 | vessels are lacking |
| b | | vessels or vessel groups are scattered |
| | 2 | scattered, without any distinct arrangement |
| | 3 | scattered, but zones with clearly different numbers of vessels are present |
| | 4 | scattered, as 2 or 3, but moreover in almost continuous, sometimes slightly interrupted, tangential series on borders of growth ring |
| c | | vessels or vessel groups arranged in short radial rows either or not combined with oblique rows |

Section I. Vessels. Group C. Arrangement of vessels or vessel groups (continued).

| Sub-groups | Index | Description |
|------------|-------|---|
| d | 5 | arranged in short or broken rows, most of them having a distinctly radial direction |
| | 6 | arranged as number 5, but moreover in fairly continuous, sometimes interrupted, tangential series on borders of growth ring |
| | 7 | arranged in short, mostly obliquely or only more or less radially directed, waving, sometimes also branching rows |
| | 8 | arranged as under 7, but moreover in almost continuous, sometimes more or less interrupted, tangential series on borders of growth ring |
| | | vessels or vessel groups in short tangential rows |
| | 9 | arranged in many short or broken sometimes waving, chiefly tangentially directed rows |
| | 0 | arranged as under 9, but moreover in almost continuous, sometimes more or less interrupted, tangential series on borders or growth ring |

So far as vessels are present, the subgroups are formed by the distinctions whether the vessels or vessel groups are scattered, or occur in short radial or oblique rows (or both), or in short tangential rows.

The distinction whether continuous tangential series are present or absent, is regarded as a secondary feature, for the reason that, although it is often of great systematic value, it forms a distinction between two species that are sometimes rather closely allied. Such rows may even occur together in one and the same species. In the case of these distinctions also it will often be necessary to make arbitrary decisions.

For there are two kinds of arrangement: one where the series are visible both with a hand lens and the unaided eye (e.g. *Quercus* and *Calophyllum* spp.), and others where this arrangement is clearly visible to the unaided eye only on the planed transverse surface (various *Lauraceae* and *Myrtaceae*). Both kinds are, however, treated of in this table as equally valuable; in reality they are not: the former is more important systematically than the latter.

In classifying woods it should not be asked whether such series occur occasionally, but whether the majority of the vessels are arranged as discussed above, or whether this arrangement is distinctly visible locally over fairly large surface areas.

Almost continuous tangential series occurring beside other groupings — mostly on zone borders — are mentioned in this connection only, if the

vessels are more numerous there, or if they are conspicuous by their large size or particular irregularity. (*Tectona grandis* and *Cedrela spp.*).

These series may also occupy several wood vessels (fam. *Verbenaceae*); this is specially the case with woods from temperate zones.

Section I. Vessels. Group D. Size and number.

| Sub-groups | Index | Description |
|------------|-------|--|
| a | 1 | vessels lacking |
| b | | without pronounced regularity in size difference |
| | 2 | vessels extremely small to medium sized; very few to moderately few |
| | 3 | vessels extremely small to medium sized; moderately numerous to very numerous |
| | 4 | vessels moderately large to extremely large; very few to moderately few |
| c | | size in growth ring varying systematically |
| | 5 | vessels extremely small to medium sized; very few to moderately few |
| | 6 | vessels extremely small to medium sized; moderately numerous to very numerous |
| | 7 | vessels moderately large to extremely large; very few to moderately few |
| d | | clearly occur in two different sizes, the most numerous kind |
| | 8 | extremely small to medium sized; total number very few to moderately few |
| | 9 | extremely small to medium sized; total number moderately numerous to very numerous |
| | 0 | moderately large to extremely large; total number very few to moderately few |

The subgrouping, in this case, is formed by the way in which the difference in size of the wood vessels comes out, i.e. without any pronounced regularity, systematic variation in the growth ring or the presence of two clearly different types.

The systematic size variation of the vessels in the growth ring is a feature of frequent occurrence in tropical woods (e.g. *Tectona grandis*; various *Euphorbiaceae*); the periodicity must, however at once be clearly visible with a hand lens and must be capable of being ascertained with sufficient certainty without carrying out measurements, otherwise the species is to be grouped under; without any pronounced regularity in size difference.

It is only seldom that two clearly different sizes of vessels occur in tropical woods, but it is more frequent in woods from the temperate zone. The introduction of this fact in subgroups will in various cases lead to an undesirable division of closely allied species, but nevertheless we hold that the advantages will offset the drawbacks. The very small vessels or vascular tracheids which often occur as groups in the neighborhood of larger vessels are left out of consideration here.

The size and numerousness, which are often of systematic importance in distinguishing between different species, but which may be highly divergent in the closely allied woods, form the subdivision of the subgroups.

The combination "moderately large to extremely large" with "moderately numerous to very numerous" was not included, because this combination will not occur except in very rare cases. It is possible, however, that the combination "moderately large to extremely large, very few to moderately few" must be extended to include also "very few to moderately numerous". In the case that the combination "moderately large" with "moderately numerous" occurs, it is advisable to use the same index as that for "moderately large and moderately few", as the vessel size is of more importance, in our opinion, than the number.

In ascertaining both number and size, the above-mentioned groups of much smaller vessels or vascular tracheids are left out of consideration.

The average number of wood vessels that is taken to occupy a few mm is determined by the number present in the normal wood elements; the bands with a larger or smaller number of vessels are ignored in counting. As regards the division of subgroup d it is from the most numerous vessels that the size is ascertained, and it is also they which form the basis for counting the numbers.

The size of the vessels has been normalized by the I. A. W. A. (1939) after Chalk (1938) had carried out the necessary measurements.

Both the classes and the terms used by this association in their agreement have been adopted by us. This classification differs but little (5 μ on the demarcation between the first two classes) from that of Den Berger and Beekman (loc. cit.).

As regards the division of the number of vessels we have followed the latter investigators. Miss Chattaway (1932) has recommended this classification for unchanged international normalization both as to the terminology and the numbers mentioned.

These examples should once more show the great utility of the hand lens method.

Section II. Rays.

Section II. Rays. Group A. Types and structure.

| Sub-groups | Index | Description |
|------------|-------|---|
| a | 1 | all rays of one type built up completely of procumbent cells |

Section II. Rays. Group A. Types and structure (continued).

| Sub-groups | Index | Description |
|------------|-------|--|
| b | 2 | consisting of procumbent cells with 1—3 rows upright |
| | 3 | consisting of procumbent cells with 1-many rows upright |
| | 4 | built up completely of upright cells |
| | | two types of rays, depending on dimensions |
| | 5 | both types consisting completely of procumbent cells |
| | 6 | the narrow type with 1—3 rows upright, the wider type consisting entirely of procumbent cells |
| | 7 | both the narrow and wide types consisting of procumbent cells with 1—3 rows upright |
| c | | two types of rays, depending on cell structure |
| | 8 | the narrow type consisting entirely or almost entirely of upright cells; the simple wider type entirely of procumbent cells |
| | 9 | the narrow type consisting entirely or almost entirely of upright cells; the simple wider type with 1—3 rows upright |
| | 0 | the narrow type consisting entirely or almost entirely of upright cells; the simple wider type with many rows upright cells or completely built up of them |

In this group 3 subgroups are distinguished: a. "all rays of one type", b. "two types of rays, chiefly depending on dimensions", c. "two types of rays, chiefly depending on the essentially different structure of the rays consisting of different kinds of cells".

The above definition of rays in one and two types differs from that given by Den Berger and Beekman (l.c.).

In the further division of the subgroups according to structure we would in the first place point out that by the expressions "1—3 (or 1-many) rows of upright cells" is meant: along the upper or lower border of the rays, or along each of the two borders of simple, not vertically fused rays (sensu Den Berger, 1926, p. 420). Vertically fused rays often contain some rows of upright cells in the middle being twice or almost twice as numerous as those at the borders, so that, when the simple rays have at most 3 rows of upright cells, 4 or 5 rows of upright cells may occur in the middle of a vertically fused ray. These rows are left out of consideration.

This situation is complicated still more if two types of essentially different structure are present. Then not only the broader types and occasionally the narrower types may occur combined, but also combinations of a narrower with a broader type are possible, forming heterogeneous

vertically fused rays with many rows of upright cells, which for the rest, closely resemble simple rays, while the genuine simple broader rays are either without or with 1—3 rows of upright cells.

In finding such rays it is advisable to ascertain whether the number of rays with many rows upright cells corresponds to the number of heterogeneous vertically fused rays which in all probability may be expected. This latter fact can to some extent be inferred from the number of combinations of two broad rays. The separation of the two broad parts of many of this type of vertically fused rays by many rows of upright cells will further indicate the presence of simple rays with many rows of upright cells.

In cases of doubt, both features are considered; sometimes (for example in some genera of the family *Euphorbiaceae*) the number of vertically fused rays is so large that neither the subgroup nor the index can be ascertained with any degree of certainty, and the real type can only be deduced on the analogy of allied species. The number of vertically fused rays may be so great that prolonged searches are necessary to find a simple broad ray, while sometimes also the number of narrow or broad rays may be so small that a close investigation is required to decide whether there are two types. In such cases a card with subgroup a is also made.

If the narrower rays consist of chiefly upright cells with a few rows of radially shortened and axially elongated cells (so-called short high cells), they are regarded as being entirely composed of upright cells and essentially different from the broader rays with procumbent cells.

In the *Malvales* tile cells generally occur. These have been described by Miss Chattaway (1933 a).

Chalk and Chattaway (1933) found perforated ray cells in 74 species of 17 families; first in *Lacistema aggregatum*. These cells connect the elements of vessels running on both sides of a ray. As neither the tile cells nor the above-mentioned perforations are visible under a hand lens, they have not been included in our scheme of classification.

Section II. Rays. Group B. Number and ratio between the numbers of both types.

| Sub-groups | Index | Description |
|------------|-------|---|
| a | 1 | total number of rays very few rather numerous (1—10 per running mm), if two kinds are present: the narrowest greatly in the minority — in the minority ($< 2/5$ of total number) |
| | 2 | ditto; the narrowest kind equally numerous ($2/5$ — $3/5$ of total number) |
| | 3 | ditto; the narrowest kind predominating ($3/5$ — $4/5$ of total number) |
| | 4 | ditto; the narrowest kind strongly predominating ($> 4/5$ of total number) |

Section II. Rays. Group B. Number and ratio between the numbers of both types (continued).

| Sub-groups | Index | Description |
|------------|-------|---|
| b | 5 | particular formations, e.g. disjunctive rays, present |
| | 6 | total number of rays numerous — very numerous (11 or more per running mm); if two kinds occur: the narrowest kind greatly in the minority — in the minority ($< 2/5$ of total number) |
| | 7 | ditto; the narrowest kind equally numerous ($2/5$ — $3/5$ of total number) |
| | 8 | ditto; the narrowest kind predominating ($3/5$ — $4/5$ of total number) |
| | 9 | ditto; the narrowest kind strongly predominating ($> 4/5$ of total number) |
| | 0 | particular formations, e.g. disjunctive rays, present |

The classification of the number of rays per running mm is that also used by Den Berger and Beekman (loc. cit.).

The subgrouping and subdivision of this group do not require further discussion. An arrangement into three subgroups, namely "number of rays very few to few, moderately few to rather numerous, numerous to very numerous", which might render good service in many cases, was omitted here, because then it would in a great many species be impossible to make a choice between the first and the second subgroup.

The same or closely allied species often show 4—8 rays. The number of rays is usually counted on the transverse surface, so that in reality the surface area which they occupy in tangential direction is determined rather than the actual number. An advantage of this method is that the elements of heterogeneous vertically fused rays also come out in the right way (see also Pfeiffer 1917, p. 234).

The relation between the number of broad and narrow rays — for the broader rays may yield narrower ones by division — has been examined by Zijlstra (1909) and Chattaway (1933 b). These investigators made their measurements on tangential surfaces.

Section II. Rays. Group C. Width and ratio between the widths of the two kinds.

| Sub-groups | Index | Description |
|------------|-------|---|
| a | 1 | all rays extremely fine or very fine ($< 25 \mu$); if two kinds are present: the narrowest kind extremely fine or very fine ($< 25 \mu$) |

Section II. Rays. Group C. Width and ratio between the widths of the two kinds (continued).

| Sub-groups | Index | Description |
|------------|-------|---|
| b | 2 | all rays moderately fine or medium sized (25—100 μ) if two kinds are present: the broadest and the narrower ones very fine to moderately fine (15—50 μ) |
| | 3 | ditto, but the narrower rays extremely fine ($< 15 \mu$) |
| c | 4 | all rays moderately broad to very broad (100—400 μ); if two kinds are present: the broadest and the narrower ones medium sized to moderately broad (50—200 μ) |
| | 5 | ditto, but the narrower rays very fine to moderately fine (15—50 μ) |
| d | 6 | ditto, but the narrower rays extremely fine ($< 15 \mu$) |
| | 7 | all rays extremely broad ($> 400 \mu$); if two kinds are present: the broadest and the narrower ones medium sized to moderately broad (50—200 μ) |
| | 8 | ditto, but the narrower rays very fine to moderately fine (15—50 μ) |
| | 9 | ditto, but the narrower rays extremely fine ($< 15 \mu$) |

The division of the rays by widths has been normalized by the I. A. W. A. (1939). This division has been adopted in the present system. The subdivision is such that the first three groups invariably include two classes of ray widths. This has been done to make it not too difficult to determine the subgroup with the available aids and appliances.

Section II. Rays. Group D. Height.

| Sub-groups | Index | Description |
|------------|-------|---------------------------|
| a | 1 | extremely low (0.5 mm) |
| b | 2 | very low (0.5—1 mm) |
| | 3 | low (1—2 mm) |
| c | 4 | rather low (2—5 mm) |
| d | 5 | moderately high (5—10 mm) |
| e | 6 | high (1—2 cm) |
| f | 7 | very high (2—5 cm) |
| | 8 | extremely high (5 cm) |

For the indices the normal division has been followed, while it has been attempted to adapt the subgrouping to a division which is of the most systematic importance.

The division relates particularly to the broader rays if two kinds of rays are present; the narrower ones are almost without exception extremely low or very low.

If the rays (here the broadest) differ very much in height, that index is used which corresponds to the height of the highest rays occurring regularly. Zijlstra (loc. cit.) has given an outline of the various heights of the rays in the secondary wood of *Fagus* and *Quercus*.

Section III. Parenchyma.

Literature review.

In this third part the selection of the features that are of the greatest importance systematically presents considerably more difficulties than in the previous sections.

For the description of parenchyma a great many schemes are known which are hardly comparable among themselves. In the accompanying scheme, however, an effort is made.

The methods of describing parenchyma fall into three groups:

The first group comprises the descriptions that follow Sanio's (1863) hardly modified or not at all. It is the classification into paratracheal, metatracheal, diffuse and terminal parenchyma. The term "terminal" is used neither by Sanio, nor by Moll and Janssonius (1906). The latter authors, however, in the general part of their work, mention as the last possibility of arranging the parenchyma: "Häufiger im spätholz der Zuwachszonen oder darauf beschränkt."

Den Berger and Beekman (1922) have used the above classification. They regard the four types of parenchyma as of equal value.

The I. A. W. A. (1933) holds the same view, except that it subdivides the paratracheal parenchyma. In addition the I. A. W. A. (loc. cit.) has adopted a special term for the parenchyma occurring in association with included phloem: "conjunctive tissue".

Two groups of authors — Pfeiffer (1921 and 1926 a) on the one hand, and Chalk (1937) and Record & Chattaway (1939) on the other, have noticed that the above classification of parenchyma does not suffice for the description of the greatly different groups possible. For this reason each of them made a new classification in which Sanio's types play a minor part. The two new classifications resemble each other in that they distinguish two instead of four main groups, i.e. paratracheal as against scattered (Pfeiffer) and paratracheal as against apotracheal (Chalk). In both systems terminal parenchyma takes a more or less separate place. Record and Chattaway (loc. cit.), who have adopted and extended Chalk's terminology, count this parenchyma as apotracheal. The terms "scattered" and "apotracheal" then include the diffuse, metatracheal and terminal parenchyma.

The classifications of Sanio, Pfeiffer, and Record and Chattaway are

| <p>Sanio (1863) Moll and Janssonius (1906) Den Berger and Beekman (1922) I. A. W. A. (1933)</p> | <p>Pfeiffer (1921, 1926)</p> | <p>Chalk (1937) Clarke (1938) Record and Chattaway (1939)</p> |
|---|--|--|
| <p>1. Paratracheal</p> | <p>1. Paratracheal (Group A) Narrow rings or parts of rings or irregular flecks</p> <p>Very distinct complete, not aliform rings, which may be occasionally confluent</p> <p>Distinct aliform rings, which sometimes are confluent here and there</p> <p>Large irregular flecks, which completely enclose the vessels and are confluent here and there</p> | <p>1. Paratracheal</p> <p>Sparingly paratracheal (cells few, not forming complete sheath) Unilaterally paratracheal (caps or hoods, typically on outer side of pore) Winged (with lateral extensions or caps) Vasicentric (with circular or oval outlines) Vasicentric-confluent (joining without wings, often diagonally) Vasicentric-conglomerate (associated with pores in clusters and bands) Aliform (tangential wing-like extensions (note if short or long)) Aliform-confluent (wing-like extensions joining laterally) Broken and irregular (tangential rather than concentric bands) Continuous and abundant (tending to form concentric bands including pores)</p> |
| <p>2. Diffuse</p> | <p>Diffuse</p> <p>— indefinitely arranged (not repeated periodically) (Group C)</p> <p>— definitely arranged (repeated periodically) (Group B)</p> <p>2. Scattered —</p> | <p>— Diffuse (single cells only or very short rows or both) — Reticulate (diffuse and short irregular rows, more or less anastomosing)</p> <p>2. Apotracheal —</p> <p>— Concentric uniseriate lines or narrow bands (typically less than 3 cells wide) Coarse bands (4 or more cells wide) — Terminal or initial</p> |
| <p>3. Metatracheal</p> | <p>Metatracheal</p> <p>— Diffuse</p> <p>— Metatracheal</p> <p>— Terminal</p> | |
| <p>4. Terminal</p> | | |

tabulated side by side. The order of the arrangement of paratracheal parenchyma used by the latter investigators has been altered with a view to better bringing out points of resemblance with Pfeiffer's arrangement. For this reason the groups B and C "definitely arranged" and "indefinitely arranged" in Pfeiffer's terminology have been interchanged in the table.

The definitions and descriptions occurring in the second column will be fully discussed below. The term "concentric" used by Record and Chattaway comprises the metatracheal and terminal parenchyma. The systematic significance of the width of the concentric parenchyma band has been demonstrated by Miss Chattaway (1932 b).

The origin of wood parenchyma is discussed by Torrey (1921). He argues that the parenchyma of *Telephragmoxyton* (*Pinaceae*) originates through the formation of partitions in long tracheids. The relationship between the various forms in which the wood parenchyma may occur has been explained by Pfeiffer (1926 a, p. 103) and Kribs (1937).

Definitions and descriptions.

The classification used here is still far from perfect, especially in regard to the **paratracheal parenchyma**.

In various genera, for instance, the paratracheal parenchyma is in fact only a part of the definitely arranged metatracheal or of the indefinitely arranged parenchyma, and it would therefore be necessary to classify the wood according to the first subgroup. As it would in a great many cases be exceedingly difficult to decide on this point, the above method has not been used.

Parenchyma bordering on the wood vessels is only considered to be metatracheal if belonging to long or short fairly continuous layers which run on unchanged where they touch the vessels, or at most partially surround one of the sides of the vessels without widening. If a band divides to enclose a vessel and immediately unites again, or if particular thickenings or spots occur, whether in direct association with the parenchyma band or not, it is considered that paratracheal parenchyma is present.

A similar distinction applies between the paratracheal parenchyma on the one hand, and the indefinitely arranged metatracheal and the diffuse parenchyma on the other hand, but in this case it is even more difficult to define. Only when these kinds of parenchyma, where they border on the wood vessels, are more abundant than in their immediate vicinity do we speak of paratracheal parenchyma.

By the term **definitely arranged parenchyma** we understand all parenchyma either arranged in long, mostly continuous although possibly irregularly divided bands, or in longer or shorter waving interrupted, broken or coalesced small bands, which themselves are periodically arranged in a regular manner. These bands mostly consist of purely metatracheal parenchyma, but may also be built up, wholly or partially, from similarly arranged diffuse parenchyma.

That these two formations are closely allied systematically is shown by the fact that they occur in all transitional forms in species of one and

the same genus (e.g. in *Xanthophyllum* spp. fam. *Polygalaceae* and *Quercus* spp. fam. *Fagaceae*).

By the term **indefinitely arranged parenchyma** we understand all metatracheal and diffuse parenchyma that is not periodically arranged in the above described way, so in the first place the typically diffuse parenchyma, short, moderately short or very short small bands and spots of different shape, so far as they occur throughout the wood or irregularly scattered in particular parts of the growth ring.

It is evident from the above that a more accurate definition of the terms **metatracheal** and **diffuse** must necessarily be introduced than was the case formerly and elsewhere (see Moll and Janssonius 1906, p. 58 and Pfeiffer 1917, p. 44).

In agreement with Den Berger and Beekman's definition (1922) we understand by purely diffuse parenchyma: individual cells, scattered between the libriform fibres, which may at most be grouped into very small flecks or short bands. As soon as a clearly tangential trend is noticeable, or when the flecks, in a tangential direction, at least reach from ray to ray, the parenchyma is called metatracheal.

Section III. Parenchyma. Group A. Paratracheal.

| Sub-groups | Index | Description |
|------------|-------|---|
| a | 1 | altogether absent or at least imperceptible |
| b | | as narrow rings or parts of rings or irregular flecks |
| | 2 | perceptible with difficulty or only occasionally |
| | 3 | more or less clearly visible around the majority of vessels |
| | 4 | more or less clearly visible in part of the growth ring visible as very distinctly complete not aliform rings which may be occasionally confluent |
| | 5 | visible around the majority of the vessels |
| | 6 | only in part of the growth ring |
| c | | visible as distinctly aliform rings, which sometimes are confluent here and there |
| | 7 | visible around the majority of the vessels |
| | 8 | visible only in part of the growth ring as large irregular flecks visible, which completely enclose the vessels and are confluent here and there |
| | 9 | visible around the majority of the vessels |
| | 0 | visible only in part of the growth ring |

So the typical paratracheal parenchyma is often seen only in combination with metatracheal or diffuse parenchyma; the complete picture is therefore not obtained until this group is combined with the groups B and C of the same section.

The subdivisions are: a. the absence of paratracheal parenchyma, b. the presence of flecks, parts of rings or simple rings, c. the occurrence of peculiarly shaped rings.

The distinction between the last two subgroups is to a certain extent parallel with the combination paratracheal and indefinitely arranged parenchyma.

In general, this distinction is of great systematic importance, but in some cases, such as with the family of the *Leguminosae* (*Acacia spp.*), both formations occur in different parts of the growth ring of one single species of wood; then the indices 8 and 0 of subgroup c are used together with one of the indices of subgroup b.

The parenchyma bands which are often found on one or both sides of the wing-like flecks are regarded as belonging to the definitely arranged parenchyma, as are also the broader very short bands or flecks that sometimes link the paratracheal parenchyma of some vessels together if this parenchyma makes the tangential wing like fleck three times as large as the radial one.

This also applies to the large irregular flecks of paratracheal parenchyma, which often coalesce, then form broad tangential parenchyma bands, which are in most cases short and irregularly divided (*Artocarpus integrifolia* L.f.), but which may occasionally become long and continuous (*Erythrina spp.* and *Pongamia spp.* fam. *Leguminosae*).

In the former case the occurrence of scattered metatracheal parenchyma is assumed if the distance between the wood vessels, in tangential direction, is more than three times greater than the tangential diameter of the vessels. In the latter case the occurrence of paratracheal parenchyma beside broad bands of definitely arranged parenchyma is assumed if the majority of the vessels in the border of the bands is completely enclosed by parenchyma, while practically all the vessels lying outside these bands are surrounded by distinctly visible parenchyma rings.

In all other cases these bands are exclusively regarded as definitely arranged metatracheal parenchyma (*Ficus spp.* fam. *Moraceae* and *Kakaona spp.* fam. *Celastraceae*).

Section III. Parenchyma. Group B. Definitely arranged
(regularly arranged bands combined with continuous bands
of metatracheal and diffuse parenchyma or otherwise).

| Sub-groups | Index | Description |
|------------|-------|--|
| a | 1 | altogether absent |
| b | | independent of the vessels or the paratracheal parenchyma or at least not clearly associated with it |

Section III. Parenchyma. Group B. Definitely arranged.

(regularly arranged bands combined with continuous bands of metatracheal and diffuse parenchyma or otherwise) (continued).

| Sub-groups | Index | Description |
|------------|-------|---|
| c | 2 | in very few to few, mostly continuous, sometimes broken or/and waving, sometimes irregularly divided bands, consisting of metatracheal parenchyma or partly or wholly of diffuse parenchyma |
| | 3 | in rather few to very numerous, mostly continuous bands, sometimes interrupted or broken or coalesced |
| | 4 | in very few to very numerous bands, sometimes fairly continuous, mostly short or very short and frequently intermittent, broken or coalesced or blending into typically diffuse parenchyma. |
| | 5 | in few to very numerous, very short, regularly arranged bands, running from ray to ray, sometimes broken or coalesced, sometimes partly or wholly composed of diffuse parenchyma |
| | | clearly associated with the wood vessels or with the paratracheal parenchyma |
| | 6 | moreover formed as described under 2 |
| | 7 | moreover formed as described under 3 |
| | 8 | moreover formed as described under 4 |
| | 9 | moreover formed as described under 5 |

As different types of definitely arranged parenchyma may occur in closely allied genera and in a few cases in one and the same genus, it was, for the purpose of subdividing the subgroups, observed whether, apart from the absence of definitely arranged parenchyma, the parenchyma is clearly associated with the wood vessels.

Something was said already on this association in the treatment of the paratracheal parenchyma. As a criterion for subgroup c it is ascertained whether by far the majority of vessels or the appurtenant paratracheal parenchyma (say, those present in that part of the growth ring in which the parenchyma occurs) is in contact with the bands and whether these bands, either by certain changes in direction or whether the vessels, by a particular arrangement, indicate that the frequent occurrence of contact is not merely accidental. As examples of the four indices of subgroup c we mention: *Tectona grandis* L; *Erythrina* spp.; *Dysoxylum* spp.; *Helicia serrata* Bl.

The four types of definitely arranged parenchyma comprise nearly all

cases. The type itself must sometimes be ascertained arbitrarily, especially the selection of indices 3 and 4 (7 and 8 resp.). Typical examples for b. 2 are: *Magnolia javanica* K et V; b 3: *Calophyllum inophyllum* L; b. 4: *Engelhardtia serrata* Bl.; b. 5: *Anonaceae*.

Section III. Parenchyma. Group C. Indefinitely arranged parenchyma (scattered at random, diffuse and metatracheal).

| Sub-groups | Index | Description |
|------------|-------|--|
| a | 1 | both kinds are lacking |
| b | | independent of the paratracheal parenchyma or of the vessels, preferably neither in their neighbourhood |
| | 2 | purely diffuse parenchyma |
| | 3 | ditto, at the same time forming transitions to extremely short, fine, metatracheal bands |
| | 4 | parenchyma as described under 2 or 3; besides: short, irregularly distributed, sometimes waving or branching, more or less tangentially running bands and/or flecks of metatracheal parenchyma |
| | 5 | as under 3, but without the diffuse parenchyma |
| c | | for the greater part clearly associated with the paratracheal parenchyma or with the vessels, or at least mainly occurring in their immediate vicinity |
| | 6 | moreover formed as described under 2 |
| | 7 | moreover formed as described under 3 |
| | 8 | moreover formed as described under 4 |
| | 9 | moreover formed as described under 5 |

This group is subdivided like the previous one; a further division according to the occurrence of periodic differences in the growth rings was regarded as being of less great systematic importance than in the case of the paratracheal parenchyma. At any rate this comes out also in Section IV, Group D.

In the light of the above considerations the subdivisions of the subgroups will be sufficiently clear. We add the following examples in explanation:

| | |
|--|-----------------------|
| b. 2: <i>Vatica</i> spp. | fam. Dipterocarpaceae |
| b. 3: <i>Alstonia villosa</i> Bl. | " Apocynaceae |
| b. 4: <i>Hopea</i> spp. and <i>Shorea</i> spp. | " Dipterocarpaceae |
| b. 5: <i>Vaccinium varingiaefolium</i> Miq. | " Ericaceae |
| c. 6: <i>Trigoniastrum</i> spp. | " Polygalaceae |
| c. 7: <i>Platea corniculata</i> Becc. | " Icacinaceae |
| c. 8: <i>Rhodamnia trinerva</i> Bl. | " Myrtaceae |
| c. 9: <i>Pithecolobium umbellatum</i> Benth. | " Leguminosae |

Section III. Parenchyma. Group D. Quantity
(paratracheal and indefinitely arranged parenchyma).

| Sub-groups | Index | Description |
|------------|-------|---|
| a | 1 | parenchyma of both types is lacking or, if present, is extremely scarce and practically imperceptible |
| b | | if perceptible, paratracheal parenchyma occurs only locally |
| | 2 | if present, indefinitely arranged parenchyma occurs only locally |
| | 3 | indefinitely arranged parenchyma scarce |
| | 4 | indefinitely arranged parenchyma superfluous |
| c | | paratracheal parenchyma scarce |
| | 5 | if present, indefinitely arranged parenchyma occurs locally |
| | 6 | indefinitely arranged parenchyma scarce |
| | 7 | indefinitely arranged parenchyma superfluous |
| d | | paratracheal parenchyma superfluous |
| | 8 | if present, indefinitely arranged parenchyma occurs locally |
| | 9 | indefinitely arranged parenchyma scarce |
| | 0 | indefinitely arranged parenchyma superfluous |

In subdividing this group, the quantity and the local occurrence or otherwise of the paratracheal parenchyma was considered of greater systematic importance, than the same features of the diffuse metatracheal parenchyma of group C. We may add that "local" does not mean here a regular occurrence in special parts of the growth rings, but a quite irregular local occurrence.

The distinction between scarce and superfluous relates to the total quantity of parenchyma and requires arbitrary decisions.

Section IV. Particular growths.

In general there is little to be said about particular growths. Except in the case of group D, the growth rings, we have exclusively to do with qualitative features, so that it is sufficient to refer here to what has been said on this point under "selection of subgroups and indices" (page 474).

Section IV. Particular growths. Group A. Included phloem, and oil cells.

| Sub-groups | Index | Description |
|------------|-------|--|
| a | 1 | both formations are lacking |
| b | | included phloem absent |
| | 2 | oil cells do occur, but exclusively in the rays |
| | 3 | oil cells occur in parenchyma and rays |
| | 4 | oil cells do occur, but exclusively in the parenchyma |
| c | | included phloem present, chiefly in groups or series |
| | 5 | oil cells lacking |
| | 6 | oil cells present, exclusively in the rays |
| | 7 | oil cells present in parenchyma and also in rays or otherwise |
| d | | included phloem present, chiefly in rather long, distinct tangential series |
| | 8 | oil cells lacking |
| | 9 | oil cells present, exclusively in rays |
| | 0 | oil cells present in parenchyma, and also in rays or otherwise |

The included phloem is a very permanent and typical feature, but occurs in only a few genera and in small number of families; for this reason it has been included in the first group of the section for purposes of subdivision. The occurrence of oil cells and the tissue in which they occur, are also of great systematic importance, but sometimes these growths are difficult to perceive, which lessens the value of this feature.

Section IV. Particular growths. Group B. Resin canals, gum ducts and latex elements.

| Sub-groups | Index | Description |
|------------|-------|--|
| a | 1 | all of the above formations are lacking |
| b | | only radial canals in the rays |
| | 2 | occurring generally scattered |
| | 3 | occurring only locally |
| c | | axial canals, largely in long or shorter rows |
| | 4 | occurring generally scattered, no radial canals |

Section IV. Particular growths. Group B. Resin canals, gum ducts and latex elements (continued).

| Sub-groups | Index | Description |
|------------|-------|---|
| d | 5 | occurring only locally; no radial canals |
| | 6 | occurring generally; moreover, radial canals in rays |
| | 7 | occurring only locally; radial canals in rays |
| | | axial canals, more or less independent, or scattered in small groups |
| | 8 | radial canals are lacking |
| e | 9 | radial canals occur as well |
| | 0 | there occur other canals, not to be included in the above descriptions |

This group is somewhat difficult to subdivide, because the available means do not allow of resin canals, gum ducts and latex elements to be distinguished from each other with certainty. It is possible, therefore, that various samples of one species, even of one and the same tree (with gum ducts) may occur both under a 1 and e 5, which might be a reason for altering the arrangement and let these groups follow each other, if not the same were possible with a 1 and b 3.

This might further induce us to give this group a still more unimportant place, if not the occurrence of resin canals in the rays and also axial resin canals was very characteristic of many genera from different families.

It is quite possible that a totally different subdivision of this group may afterwards prove desirable.

Section IV. Particular growths. Group C. Storied structure, radial intercellular canals, pith flecks and bast fibre formations.

| Sub-groups | Index | Description |
|------------|-------|--|
| a | | storied structure absent |
| | 1 | all of the above formations absent |
| | 2 | storied structure absent; radial intercellular canals absent pith flecks present ; bast fibre formations absent |
| | 3 | storied structure absent; radial intercellular canals present , pith flecks absent; bast fibre formations absent |
| | 4 | storied structure absent; radial intercellular canals present , pith flecks present ; bast fibre formations absent |

Section IV. Particular growths. Group C. Storied structure, radial intercellular canals, pith flecks, bast fibre formations (continued).

| Sub-groups | Index | Description |
|------------|-------|---|
| b | 5 | storied structure absent; bast fibre formations present ; radial intercellular canals and pitch flecks present or absent |
| | | storied structure present |
| c | 6 | storied structure present ; radial intercellular canals absent; pith flecks absent; bast fibre formations absent |
| | 7 | storied structure present ; radial intercellular canals absent; pith flecks present ; bast fibre formations absent |
| | 8 | storied structure present ; radial intercellular canals present ; pith flecks absent; bast fibre formations absent |
| | 9 | storied structure present ; radial intercellular canals present ; pith flecks present ; bast fibre formations absent |
| | 0 | storied structure present ; bast fibre formations present ; radial intercellular canals and pitch flecks present or absent |

The subdivision of this group depends on the absence or presence of storied structure. This distinction is not of inconsiderable systematic importance in that the occurrence of storied structure is limited to only a few families.

As against this there is the fact, however, that although storied structure is a constant feature of some species, it is quite occasional in others, and is further useful as a general and specific characteristic in only very few genera.

Record (1927) has given a detailed outline with a bibliography on orders, families and genera showing storied structure.

The systematic significance of the occurrence of storied structure has been explained by Janssonius (1931). He demonstrated that storied structure does not occur when the ground tissue consists of fibre tracheids. A similar negative correlation was noticed by Chalk (1937), which he extended to scalariform perforation plates and storied structure. As fibre tracheids and scalariform perforation plates are regarded as primitive features, storied structure must count as a highly specialized characteristic. Chalk calculated that of the 1272 Dicotyledonous genera examined by him only 18 per cent exhibited storied structure.

Intercellular canals, possessed by only very few genera, are often of limited local occurrence, so that only their presence is of importance systematically.

Pith flecks may be found in numerous species and can hardly be considered indications; it is only in a few species that they occur regularly; they are never a quite general, nor a specific feature.

The bast fibre formations of some wood species (*Eugenia* spp. fam. *Myrtaceae* and *Koompassia* sp. fam. *Leguminosae*), which, although not general, are peculiar to these species, are of a very special structure. They are tangential layers of a bark-like tissue of one to several mm thick, which, in axial and radial direction, mostly do not extend any farther than a few cm to at most 1 dm and which, in certain cases, are invariably intermittent, the various layers being connected by radial bands of a particular tissue resembling intercellular canals (especially in *Eugenia* spp. Kolat lapis).

A study about the identification of wood with included phloem, which does not enclose the above examples, has been published by Chalk and Chattaway (1937).

As these formations, if small, sometimes resemble pith flecks and intercellular canals and do occur in a few species only, to which they are then peculiar, the simultaneous occurrence or absence of both last-named features may be considered of so secondary an importance that no further subdivision has been based on it.

Section IV. Particular growths. Group D. Growth rings.

| Sub-groups | Index | Description |
|------------|-------|--|
| a | 1 | growth rings lacking or vague |
| b | 2 | growth rings moderate to very conspicuous owing to pronounced periodicity in the number or in the arrangement of the vessels and not in the parenchyma |
| | 3 | growth rings moderate to very conspicuous owing to pronounced periodicity in the size of the vessels and not in the parenchyma |
| c | 4 | growth rings moderate to very conspicuous owing to pronounced periodicity in the definitely arranged parenchyma and not in the vessels |
| | 5 | growth rings moderate to very conspicuous owing to pronounced periodicity in the definitely arranged parenchyma and in the vessels as well |
| d | 6 | growth rings moderate to very conspicuous owing to pronounced periodicity in the indefinitely arranged parenchyma and not in the vessels |
| | 7 | growth rings moderate to very conspicuous owing to pronounced periodicity in the indefinitely arranged parenchyma and in the vessels as well |
| e | 8 | growth rings moderate to very conspicuous owing to pronounced periodicity in the paratracheal parenchyma and not in the vessels |

Section IV. Particular growths. Group D. Growth rings (continued).

| Sub-groups | Index | Description |
|------------|-------|---|
| | 9 | growth rings moderate to very conspicuous owing to pronounced periodicity in the paratracheal parenchyma and in the vessels as well |
| f | 0 | growth rings moderate to very conspicuous, but characterized in different ways from those mentioned above |

The above subgrouping is based on the occurrence or absence of periodicity in the various types of parenchyma. The periodicity in the vessels, both in size and number, is regarded as of secondary systematic importance, although this feature may be especially significant in distinguishing nearly allied species.

In this group the typical indices should be selected very arbitrarily and the principal ones chosen if a number of elements and tissues participate in the formation of growth rings. It is possible, for instance, that the wood vessels (in size and number) and the paratracheal, as well as the definitely arranged and indefinitely arranged parenchyma show a certain periodicity bringing out the growth rings (e.g. fam. *Leguminosae*). This case is then indicated as c/d 5/7; the formation b. 2 and b. 3 is included in c. 5, d. 7 and e. 9, while subgroup e, as being of secondary importance, is ignored.

Subgroup f is chiefly used to indicate a distinct periodicity in the tissue density; it is exclusively employed if this last-named formation is the only one in which the growth rings find expression, or if, beside others, it is very conspicuous.

Section V. Other characteristics.

The following characteristics are practically valueless in making primary and secondary distinctions in systematics, but very often yield useful, sometimes even the only features for telling apart allied species, and as such they are indispensable.

Section V. Other characteristics. Group A. Specific gravity.

| Sub-groups | Index | Description |
|------------|-------|-----------------------------|
| a | 1 | extremely light < 0.3 |
| | 2 | very light 0.3 — 0.4 |
| b | 3 | light 0.4 — 0.5 |
| | 4 | moderately light 0.5 — 0.6 |
| c | 5 | moderately heavy 0.6 — 0.75 |
| d | 6 | heavy 0.75 — 0.9 |
| e | 7 | very heavy 0.9 — 1.05 |
| | 8 | extremely heavy > 1.05 |

This subdivision, which is also given by Den Berger and Beekman (1922), is self-explanatory. The not elaborate division of the subgroups is more suited to the wood species that often differ rather considerably in specific gravity, although there will also be borderline cases here, where the letters of two subgroups have to be used.

Section V. Other characteristics. Group B. Cutting hardness and grain.

| Sub-groups | Index | Description |
|------------|-------|---|
| a | 1 | soft , cuts easily, straight-grained without cross-fibres |
| | 2 | soft, cuts easily, straight-grained with cross-fibres |
| | 3 | soft, cuts easily, grain wavy or twisted |
| b | 4 | moderately hard , cuts with moderate difficulty, straight-grained without cross-fibres |
| | 5 | moderately hard, cuts with moderate difficulty, straight-grained, with cross-fibres |
| | 6 | moderately hard, cuts with moderate difficulty, grain wavy or twisted |
| c | 7 | hard , difficult to cut, straight-grained without cross-fibres |
| | 8 | hard, difficult to cut, straight-grained with cross-fibres |
| | 9 | hard, difficult to cut, grain wavy or twisted |

As the hardness of a wood is, generally, a more constant type of feature than the trend of the grain, the former characteristic was used as a basis for the subdivision. It is evaluated according to the relative ease with which the end surface can be cut.

Section V. Other characteristics. Group C. Colour.

| Sub-groups | Index | Description |
|------------|-------|--|
| a | 1 | dark brown, very dark yellowish brown to black |
| b | 2 | yellowish brown, deep brownish yellow or dark greenish yellow |
| | 3 | bright yellow, deep yellow, straw-yellow, etc. |
| c | 4 | light brownish yellow, light greyish yellow, light greyish brown, yellowish grey, brownish grey, greenish grey |
| | 5 | yellowish white, dingy white, greyish white, purplish white |

Section V. Other characteristics. Group C. Colour (continued).

| Sub-groups | Index | Description |
|------------|-------|---|
| d | 6 | light grey, pinkish grey, light purplish grey, orange grey, light pink |
| | 7 | dark pink, greyish red, grey reddish brown, greyish purple or dark grey |
| | 8 | bright reddish brown or brownish red, orange brown, greyish orange |
| e | 9 | bright orange, vivid red, brick red |
| | 0 | dark red, dark-reddish brown to almost black |

The succession of colours chosen is such that the modifications occurring in various wood species or in one hand the same genus usually are in this order, so that, if two non-consecutive indices are stated, it may be assumed that colours belonging to intermediate indices occur as well. Only in a few cases (e.g. in the genus *Dialium* fam. *Leguminosae*) both extremes are found, the colours varying from red to dark red, to dark brown and yellowish brown. In such a case this is expressed by placing the highest indices in front and filling in the card as follows: e/b 9/2, which shows that also a. 1 is included.

If a genus, generic group or subgenus exhibits two quite different colours, transition colours being absent, this is indicated by means of a hyphen (e.g. b—d, 3—8, or a—c, 1—5).

Section V. Other characteristics. Group D. Gloss and smell.

| Sub-groups | Index | Description |
|------------|-------|--|
| a | 1 | smell not characteristic , gloss slight |
| | 2 | smell not characteristic, gloss moderate |
| | 3 | smell not characteristic, gloss distinct |
| | 4 | smell not characteristic, gloss fine |
| | 5 | smell not characteristic, gloss very fine |
| b | 6 | smell characteristic , gloss slight |
| | 7 | smell characteristic, gloss moderate |
| | 8 | smell characteristic, gloss distinct |
| | 9 | smell characteristic, gloss fine |
| | 0 | smell characteristic, gloss very fine |

This last group does not call for much comment, if characteristic, the odour is often a specific, but seldom a general feature, because it is sometimes lacking or disappears.

The gloss is often a general feature; it seldom occurs alone, but sometimes associated with some other characteristics. From these considerations we chose the presence or absence of a characteristic odour as a basis for the above subdivision. Odour, however, can hardly be considered as of more or less systematic importance.

IV. THE APPLICATION OF THE SCHEME IN PRACTICE.

A. Order and priority of the features.

As far as can be judged at present, the priority of the features, from a systematic point of view comes out most in the following order: I A, II A, III A—I B, II B, III B—I C, II C, III C—next IV A, IV B, IV C and IV D; then I D, II D, III D and finally V A, V B, V C and V D. The classification will anyway have to be started in this way.

Although, for purposes of classification alone, the simplest plan is to adopt exclusively the decimal system, it will be desirable considering the relationship between this scheme of classification and the botanical natural system, first to make a classification according to the subgroups (either wholly or partially) and then to resubdivide the resulting subgroups according to the indices, again going through the entire part of the classification system already used.

Provisionally a division by means of index cards alone is made according to the first series of group I A, II A, III A, I B, II B, III B, I C, II C, III C and based on the subgroups. In those cases where cards of different genera or even families coincide, a subdivision can be made in the manner best suited to that set of cards, although, as far as possible, one or more definite systems of further subdivision must nevertheless be used. Not until all families have been classed can any additional decisions on this point be made.

As stated above, it was at first attempted to group features in the order of their probable systematic importance. One should, however, not put one's expectations too high; as even the so called natural system on which the classification of plants in groups, families and genera is based has many exceptions and closely allied plants obviously exhibit fundamental differences, it goes without saying that such exceptions are much more frequent here. In the case of the perforation plate, for instance, i.e. the feature that we have provisionally adopted as the principal one, in the systematics of wood anatomy, different families show different types. Here are even different genera some species of whose secondary wood have exclusively simple perforations, others both simple and scalariform perforation plates, and still others exclusively scalariform perforation plates. The features of the different families sometimes overlap, so that one family whose perforation plates are constantly similar may suddenly be found to include a genus possessing another type of perforation. *Theaceae*, e.g. which,

according to Den Berger (1920) only have scalariform perforation plates, include the genus *Architea*, all possessing simple perforations.

The same may be said of the other features, mostly even in a much higher degree.

This point may be elucidated with a single example for the second most important feature: 1 or 2 types of rays. All the genera of the *Guttiferae* examined by us possess two types of rays. The genera *Calophyllum* and *Cratoxylon* include another type having one kind of rays.

Once a clear statistic outline has been obtained it will appear that in one family this feature is the most constant, in another that feature.

Beforehand, however, the features must be clearly and sharply defined. In the foregoing pages the features of each table have been described as explicitly as possible. Under "Selection of subgroups and indices" we give the line of action to be followed in doubtful cases.

B. Descriptions; cards and systems; selection of subgroups and indices.

The system is applied as follows:

Of all the samples under investigation model descriptions are made (see IV D), from which, in a manner to be explained later, the classification scheme is composed. This scheme is printed on the description form under the heading: "Further particulars".

Then two or more cards are made, which are filed in two systems — classed alphabetically and according to the subgroups (see IV C). For the models of these cards see IV E. The cards comprise: the classification scheme, systematic botanical data, the sample numbers and additional remarks, if any.

Evidently, the correct selection of subgroups or index must often take place arbitrarily and intelligently, as nature abhors sharp lines of demarcation. It is exactly rigid delimitation, however, which is a primary necessity in a classification system such as the present one.

For this reason, the limits drawn in the subdivision of each group have been accurately described. It must further be ascertained what general rules have to be observed in the arbitrary selection of the indices. If **quantitative features*** are in question it is advisable, in general, not to search for extreme cases, such as are found in each wood; in determining whether in a certain species the vessels occur in groups of 2—4 or 2-many, for instance, do not try to find somewhere in the back a single group of more than 4 vessels, and if so, do not use at once the index belonging to the second case, but ascertain whether the occurrence of such groups of more than 4 vessels is a constant feature that is easily found in different places. Also, in determining the number of rays, do not look everywhere for an extraordinarily large number of rays over a width of 1 mm, but count about ten times over a distance of 1 mm, preferably, say, over twice 5 mm, and then take the average.

Quite different is the searching for two types of perforation plates,

* See also Desch (1932) and Rendle and Clarke (1934).

two types of rays or the presence of resin canals, etc., in short, **qualitative** features. Then one swallow does make summer, persistent and careful search of all the surfaces being a necessity.

If, in the case of such a feature, identification is very difficult, and if it is necessary to search long, also that index is entered on the card which would have been taken if this particular formation had not been found.

In order to indicate, however, that one index is only a result of erroneous observation, this figure is indicated in red or italics. If in preparing a collective card for a genus or subgenus, such a formation does occur in some, but decidedly not in other species, both figures are given in black. If there is a gradual transition between different species (e.g. in *Cyclostemon* fam. *Euphorbiaceae*, some species of which possess exclusively simple perforations, others simple and scalariform, and still others exclusively scalariform ones), the letters and figures are placed, say, as follows: c/d, 6/7.

9/0

If, however, two sharply separated cases are found (e.g. in the genus *Calophyllum* fam. *Guttiferae*, showing rays both in two and one type) the indices might be placed as follows: a—b, 4—9 or a 4 This at the
b 8/9.

same time renders it possible to make more detailed descriptions. As to cutting hardness and grain, e.g. 1 b. 4/5 will signify: the wood (or woods) is straight-grained and has little cross-fibre; b, 4—5, denotes, however, that in some samples cross-fibres are absent and in others present.

If it cannot be ascertained with sufficient certainty whether a given formation has been correctly classified, a note of interrogation is placed over the column containing the index in question. If, as a result of the very fine texture of the wood, it is quite impossible to determine the most probable index, a note of interrogation is placed in the square in question. Exactly the same procedure with quantitative features is followed: in borderline cases, or if different samples show transitions between two headings, this is indicated by means of a dash; otherwise a diaeresis is used.

If one of the subordinate features is particularly characteristic, or especially suitable for distinguishing one wood species from an as to the rest very similar one, then the index belonging to that feature is underlined.

C. Arrangement of the cards; systems of identification.

The cards may be arranged by the following methods:

Arrangement according to Pfeiffer.

The cards are filed in two systems.

In one system the cards, filled in as completely as possible, are arranged alphabetically according to family and genus. In the second system the cards are arranged according to subgroups, and afterwards according to

indices in the order already described under IV A, care being taken to approximate a "natural" division as far as possible. It may be stated now already, that this will be possible only approximately. In order to prevent the cards of both systems from being mixt up the four types of cards might be chosen of a different colour.

Under either system two colour cards are used, i.e. the collective cards for samples belonging to one and the same genus or subgenus are in one, the cards for completely defined species (either already fully identified and named) being in the other colour.

The second set, which at the same time has to serve as an identification table, always must be kept complete; the first set may be used in tracing generic subfamily and family characteristics, and in collecting statistical data; here it should invariably be possible for the cards to be grouped in different ways. The original order (alphabetical according to families) is always easy to restore again.

In filing the cards in the system according to the subgroups, it is advisable to follow the two rules:

1. Figures or letters, red or in italics, occurring in one and the same square with figured or letters in black, are ignored in the classification.
2. If several black letters or figures occur in one square the lowest number or the foremost letter is taken first.

In order to allow of a proper identification, even when almost unavoidable errors are made, and also in borderline cases, several cards are made, where, in the squares with several letters (and figures, if any), the previous letters, or in the case of red or black letters, the black letters, are omitted. As many cards are made as correspond to the actual number of cases, the other cards being referred to at the foot of the card under the heading "particulars". The completest card, which therefore corresponds to the one occurring in the other system, is regarded as the principal card. From the cards of fully defined species only one card is made for the determination system, which is to be as detailed as possible. If several cards are made for such a species, for the others only genera-cards are used, referring to the primary indices of the complete card. In making extra cards for borderline cases and errors we did provisionally not go further than the letter indices of the above mentioned first series of groups.

Arrangement according to Bianchi.

A. T. J. Bianchi, at the time placed at the disposal of the Head of the Technological Department of the Forestry Experiment Station at Buitenzorg, suggested the following alteration in the arrangement of the cards in practice, which is well worth adopting.

All combinations of the subgroups of the nine groups used for the first division (IA, IB, IC, IIA, IIB, IIC, and IIIA, IIIB, IIIC) are arranged by him according to a table, indicating them by combination of two groups of figures, the former running from 1—36, the latter from 1—432. In this way 12312 different figure combinations are obtained, each indicating one of the possible combinations of the subgroups, e.g. 11/375.

TABLE III.

Table for the transposition of the subgroup combinations into a combination of two figure groups, according to which the arrangement takes place, if vessels are present.

| First figuregroup | | | | Second figuregroup | | | | | | | | | | | | | | | | | | | |
|-------------------|----|-----|----|--------------------|----|-----|---|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|
| A | | | | B | | | C | C II | a | | | b | | | c | | | d | | | | | |
| I | II | III | | I | II | III | I | C III | a | b | c | a | b | c | a | b | c | a | b | c | | | |
| b | a | a | 10 | b | a | a | b | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | |
| | | b | 11 | | | b | c | | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | | | |
| | | c | 12 | | | c | d | | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | | | |
| | b | a | 13 | | b | b | b | | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | | | |
| | | b | 14 | | | c | c | | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | | | |
| | | c | 15 | | | d | d | | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | | | |
| | c | a | 16 | | c | b | b | | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | | | |
| | | b | 17 | | | c | c | | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | | | |
| | | c | 18 | | | d | d | | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | | | |
| c | a | a | 19 | b | a | b | b | | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | | | |
| | | b | 20 | | | c | c | | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | | | |
| | | c | 21 | | | d | d | | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | | | |
| | b | a | 22 | | b | b | b | | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | | | |
| | | b | 23 | | | c | c | | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | | | |
| | | c | 24 | | | d | d | | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | | | |
| | c | a | 25 | | c | b | b | | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | | | |
| | | b | 26 | | | c | c | | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | | | |
| | | c | 27 | | | d | d | | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | | | |
| d | a | a | 28 | c | a | b | b | | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | | | |
| | | b | 29 | | | c | c | | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | | | |
| | | c | 30 | | | d | d | | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | | | |
| | b | a | 31 | | b | b | b | | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | | | |
| | | b | 32 | | | c | c | | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | | | |
| | | c | 33 | | | d | d | | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | | | |
| | c | a | 34 | | c | b | b | | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | | | |
| | | b | 35 | | | c | c | | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | | | |
| | | c | 36 | | | d | d | | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | | | |
| | | | | | b | a | b | | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | | | |
| | | | | | | c | c | | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | | | |
| | | | | | | d | d | | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | | | |
| | | | | | b | b | b | | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | | | |
| | | | | | | c | c | | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | | | |
| | | | | | | d | d | | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | | | |
| | | | | | c | b | b | | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | | | |
| | | | | | | c | c | | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | | | |
| | | | | | | d | d | | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | | | |

Now the system is divided into 36 sections by means of simple index cards, bearing the numbers 1—36, the cards being filed in each of these sections in accordance with the order of the figures of the two groups. In this way the cards come to stand in quite the same order as in the system described previously, but it is much easier to arrange them and to find certain combinations.

In subsequent identification the method is as follows: Prepare a card in the manner described before, take the corresponding number from the table below (or numbers, if the card shows several combinations), and find the appropriate card (or cards).

The numbers are placed in the right hand top corner of the cards, over the word "order", in such a way that after the last group of figures enough space is left for a third figure group to be used if a further subdivision should be contemplated.

TABLE IV.

D. Example of a wood description.

| | |
|--|---|
| Name: <i>Aleurites moluccana</i> (L.) Willd. | Order: <i>Geraniales</i> (sensu Engler) |
| No.: 1746, 2101 | Family: <i>Euphorbiaceae</i> <i>Crotonoideae</i> <i>Chrozophoreae</i> |

A. Structure of the wood.

| | | |
|----------|--------------|--|
| Vessels: | Plates: | simple perforations. |
| | Grouping: | majority solitary, only few groups of 2 to many. |
| | Arrangement: | scattered. |
| | Size: | moderately large. |
| | Number: | few in general, sometimes moderately few locally. |
| | Bordering: | bordered by rays mostly on two, always on one side, for the rest almost invariably surrounded by parenchyma. |
| | Elements: | 1—2 per running mm. |
| | Contents: | not characteristic. |
| Fibres: | | |
| Rays: | Types: | clearly in two types. |
| | Structure: | the narrow rays completely of upright cells; the broader rays, as far as they are simple, composed of only few rows of procumbent cells with 1—3 rows of upright cells. Vertically fused rays very frequent. |
| | Number: | rather numerous (8—10); ratio of the numbers not to be determined. |

TABLE IV (continued).

| | |
|---------------------|---|
| Width: | the broader ones very fine to moderately fine, the narrowest extremely fine to very fine, ratio difficult to determine. |
| Height: | very low. |
| Parenchyma: | Paratracheal parenchyma present as a rather broad mostly complete ring, with numerous outgrowths of scattered parenchyma. Definitely arranged, in extremely short fine bands of diffuse and metatracheal parenchyma, rather regularly arranged but in some places betraying a distinct association with the paratracheal parenchyma, and locally, where the vessels are few, irregular or absent and resembling indefinitely arranged parenchyma. Indefinitely arranged parenchyma, present as diffuse and as extremely short fine bands; scanty. |
| Particular growths: | Included phloem; lacking. Resin and other ducts: not noticed. Storied structure: lacking. Pith flecks: not noticed. Growth rings: lacking or extremely vague. |

B. Other features:

| | |
|-------------------|-------------------|
| Specific gravity: | very light. |
| Hardness: | soft, easily cut. |
| Grain: | straight. |
| Feel: | |
| Colour: | yellowish white. |
| Gloss: | moderate. |
| Smell: | |
| Taste: | |
| Burning: | |
| Extract: | |

C. Further particulars.

Literature about the species in question:

Scheme of classification: 17/77

| | I | | II | | III | | IV | | V | |
|---|---|---|----|-----|-----|-----|----|---|---|---|
| A | b | 2 | c | 9 | b | 4 | a | 1 | a | 2 |
| B | b | 4 | a | ? | a-c | 1-9 | a | 1 | a | 1 |
| C | b | 2 | b | 2 | b-c | 2-8 | a | 1 | c | 5 |
| D | b | 4 | b | 2/3 | b | 2-4 | a | 1 | a | 2 |

TABLE V.

E. Examples of filled-up cards.

Green:

Species card for the botanical arrangement.

| | | | | | | | | | | Order: 17/77-78 | |
|---|---|---|---|-----|-----|-----|---|----|---|-----------------------|--|
| | | | | | | | | | | <i>Geraniales</i> | |
| | | | | | | | | | | Family: | |
| | | | | | | | | | | <i>Euphorbiaceae</i> | |
| | | | | | | | | | | Subfamily: | |
| | | | | | | | | | | <i>Crotonoideae</i> | |
| | | | | | | | | | | Tribus: | |
| | | | | | | | | | | <i>Chrozophoreae</i> | |
| | | | | | | | | | | Genus: | |
| | | | | | | | | | | <i>Aleurites</i> | |
| | | | | | | | | | | Species: | |
| | | | | | | | | | | <i>moluccana</i> (L.) | |
| | | | | | | | | | | Willd. | |
| | | | | | | | | | | | |
| | I | | | II | | III | | IV | | V | |
| A | b | 2 | c | 9 | b | 4 | a | 1 | a | 2 | |
| B | b | 4 | a | ? | a-c | 1-9 | a | 1 | a | 1 | |
| C | b | 2 | b | 2 | b-c | 2-8 | a | 1 | c | 5 | |
| D | b | 4 | b | 2/3 | b | 2-4 | a | 1 | a | 2 | |

Nos. 1746. 2101.
Particulars: In some samples, the definitely arranged parenchyma may be partly or wholly regarded as indefinitely arranged.

White:

Species card for the arrangement according to classification number.

| | | | | | | | | | | Order: 17/77-78 | |
|---|---|---|---|-----|-----|-----|---|----|---|-----------------------|--|
| | | | | | | | | | | <i>Geraniales</i> | |
| | | | | | | | | | | Family: | |
| | | | | | | | | | | <i>Euphorbiaceae</i> | |
| | | | | | | | | | | Subfamily: | |
| | | | | | | | | | | <i>Crotonoideae</i> | |
| | | | | | | | | | | Tribus: | |
| | | | | | | | | | | <i>Chrozophoreae</i> | |
| | | | | | | | | | | Genus: | |
| | | | | | | | | | | <i>Aleurites</i> | |
| | | | | | | | | | | Species: | |
| | | | | | | | | | | <i>moluccana</i> (L.) | |
| | | | | | | | | | | Willd. | |
| | | | | | | | | | | | |
| | I | | | II | | III | | IV | | V | |
| A | b | 2 | c | 9 | b | 4 | a | 1 | a | 2 | |
| B | b | 4 | a | ? | a-c | 1-9 | a | 1 | a | 1 | |
| C | b | 2 | b | 2 | b-c | 2-8 | a | 1 | c | 5 | |
| D | b | 4 | b | 2/3 | b | 2-4 | a | 1 | a | 2 | |

Nos. 1746. 2101.
Particulars: In some samples, the definitely arranged parenchyma may be partly or wholly regarded as indefinitely arranged.

TABLE V (continued).

Yellow:

Species card for the arrangement in both the systems.

| | I | | II | | III | | IV | | V | |
|---|---|---|----|-----|-----|-----|----|---|-----|-----|
| A | b | 2 | c | 9 | b | 4 | a | 1 | a/b | 2/4 |
| B | b | 4 | a | ? | a-c | 1-9 | a | 1 | a/b | 1/4 |
| C | b | 2 | b | 2 | b-c | 2-8 | a | 1 | c | 4 5 |
| D | b | 4 | b | 2/3 | b | 2-4 | a | 1 | a | 2 |

Order: 17/77-78

Geraniales

Family:

Euphorbiaceae

Subfamily:

Crotonoideae

Tribus:

Chrozophoreae

Genus:

Aleurites

Species:

moluccana (L.)

Willd.

Nos. 1746. 2101. 2140. 2435.

Particulars: In some samples definitely arranged parenchyma may, although wrongly, be partly or wholly regarded as indefinitely arranged parenchyma.

Reference card for species mentioned twice.

| | I | | II | | III | | IV | | V | |
|---|---|---|----|-----|-----|---|----|---|-----|-----|
| A | b | 2 | c | 9 | b | 4 | a | 1 | a/b | 2/4 |
| B | b | 4 | a | ? | a | 1 | a | 1 | a b | 1/4 |
| C | b | 2 | b | 2 | c | 8 | a | 1 | c | 4/5 |
| D | b | 4 | b | 2/3 | b | 4 | a | 1 | a | 2 |

Order: 17/6

Geraniales

Family:

Euphorbiaceae

Subfamily:

Crotonoideae

Tribus:

Chrozophoreae

Genus:

Aleurites

Species:

moluccana

Nos.

Particulars: The apparently indefinitely arranged parenchyma is in fact definitely arranged: See also III b-c 9 and III c-b, 2, so 17/77-78.

V. DISCUSSION.

A. Comparison of the decimal system with other systems of classification and identification.

Arrangement of characteristics.

In the literature a number of schemes are to be found intending to give a universal method for the classification and identification of woods. The features mentioned are arranged in the following ways:

- a. The features are not all correlated with each other by numbering or lettering, e.g. Lecomte (1923), Record (1934a) and Normand (1934).
- b. The features are numbered consequently, so that these systems do not make it clear that certain features are subordinate to each other (Beverluis 1925, Clarke 1938, Record and Chattaway 1939).
- c. Non equivalent features are partly classed as subordinate to each other. Besides, however, such features or feature groups are given the same importance. Moll and Janssonius (1906).

In the above decimal system of classification, however, all the features and feature groups are consistently divided in such a manner that only groups of nearly equal importance are placed side by side. These feature-units, which may also more or less be regarded as of equal importance, have been subordinated to greater characteristic units and so forth. The great advantage of this method is that the scheme of classification thus composed automatically yields the possibility of identification, which is not the case in any of the other systems described above.

Systems of identification.

The identification system based on the decimal classification has the same advantages as the systems in which the number of wood species included can be extended at random. Our system also employs loose cards. Drawbacks attaching to the existing method using loose cards have been removed. The advantages thus obtained are as follows:

- a. The number of features that can be made use of are not determined by the dimensions of the cards, such as in Clarke's system.
- b. Neither is the number of wood species that can be included in the system determined by these dimensions. This is the case in Bianchi's system.
- c. The cards do not need to be punched. In punched cards the holes which do not run on to the edge of the card will wear out on prolonged and frequent use, which may give rise to erroneous result. A similar drawback has come to the front when this method was used in another field, viz. for the classification of literature data.

B. Possibilities of the decimal system.

As already appeared from the example of a wood description (see IV, D), it is not our intention to substitute the decimal system of classification of the description of woods by a numerical system. This would

render it impossible to use numerous fine shades. The scheme can, however, give lines of action to be pursued with a view to establishing a certain order of description, so that uniformity in the treatment of the woods is guaranteed.

Linking up with morphological systematics.

Apart from the possibility of arriving at a botanically justified classification and identification of woods, and of assisting in discovering their mutual relationships, the common indices of the decimal system also give the basis for a fourth kind of investigation, as they make it possible easily to gain an idea of the distribution of certain features and their variability. In morphological botanical systematics such "feature phylogeny" is very much in the ascendant* and in wood anatomy the influence of it is clearly noticeable. This appears from the publications of Record (1931, 1934 b, 1936 a and b); Frost (1930 and 1931); Janssonius (1931); Chalk (1937); Kribs (1937) and many others, some of which have already been mentioned. Consequently the systematic anatomic examination of woods can easily adopt itself to the newer trends in botanical systematics.

Extension of the scheme.

On page 439 we discussed the desirability of applying the decimal classification also to features, which can only be observed with sufficient accuracy with the aid of a compound microscope. Far the best plan is to use all available means in the classification of wood species according to their mutual relationship.

A quick and practical method of identification only requires the application of macroscopically perceivable features (hand lens method). As a result we think it advisable that the classifications for macroscopically and exclusively microscopically perceivable features should be kept apart.

They run, however, largely parallel. The most suitable solution of the problem seems, therefore, to design a second classification in which the above features are combined with those which are exclusively perceivable through the microscope. This classification can possibly be arranged in such a way that these last named features are mentioned in the second place so that they may at will be used or not.

A recently provisionally elaborated scheme of microscopical features, using decimal indices includes a division for vascular tracheids, fibre-tracheids and libriform wood fibres, while, among others, groups have been formed for the nature, the position and the dimensions of pits, striation and stratification of the wall, and the lengths of different elements. This point will be discussed separately in due course.

*) Hayata (1921, 1928 and 1931); Vavilov (1921); Zimmermann (1930); Lam (1938).

VI. SUMMARY.

1. The literature gives various methods to compile a universal scheme for the classification and identification of wood species. To attain this object a new method is now given possessing various advantages over the methods that have been used so far.
2. The wood structure is subsequently described using decimal indices. Each of five sections of features are divided into four groups, and these again in subgroups, which have been worked out by means of indices. In the treatment of various features literature data are discussed.

The classification of wood species aims at obtaining a grouping which, as far as possible, links up with the botanical groupings according to natural systems.

3. On the grounds given in the introduction and the discussion, the classification has been applied to features which can be perceived both with the unaided eye and a hand lens. The desirability and the possibility of classifying microscopic features in a similar way are dealt with briefly.
4. On the classification scheme an identification method is based employing loose cards. In this way, the number of woods included can be extended at will. Drawbacks attaching to the loose-card methods, used so far, have been obviated.
5. It is suggested that the decimal indexing of features should be normalized internationally.

The authors should greatly appreciate to receive any remarks and suggestions that might improve and supplement the classification system described.

Amsterdam/Delft, August 1944.

VII. INDEXES.

A. Literature.

1. BEEKMAN, H. (1920). 78 Preanger-houtsoorten. Beschrijving, afbeelding en determinatietabel. Mededeeling van het Proefstation voor het Boschwezen No. 5. Java.
2. BERGER, L. G. DEN (1920). Practische identificatie van hout. *Tectona* 14, 885.
3. — en H. BEEKMAN (1922). Inleiding tot de herkenning van hout in de praktijk. Mededeeling van het Proefstation voor het Boschwezen No. 7. Java.
4. — (1926). J. R. Beversluis. De mikrografische identificatie van hout. *Tectona* 19, 413.
5. — en A. T. J. BIANCHI (1931). Over het voorkomen van eenige bijzondere kenmerken bij Nederlandsch-Indische houtsoorten (with a summary in English). *Tectona* 24, 894.
6. BEVERSLUIS, J. R. (1925). De micrografische identificatie van hout. Thesis Wageningen.
7. BIANCHI, A. T. J. (1931). Een nieuwe determinatiemethode. *Tectona* (Buitenzorg Java) 24, 8/9, 884—893. Aug./Sept. 1931. Ref. Trop. Woods 29, 1932, p. 53.
8. BIENFAIT, J. L. and J. PH. PFEIFFER (1924). A scheme for systematic identification of woods with the aid of a hand lens. *Journ. of Forestry* 22, 7, 724.
9. CHALK, L. (1933). Multiperforate plates in vessels. *Forestry* 7, 16.
10. — and M. M. CHATTAWAY (1933). Perforated ray cells. *Proc. of the Royal Soc. B*, 113.

11. — (1934). Measuring the length of vessel members. *Trop. Woods* 40, 19.
12. — (1935). Factors affecting dimensional variations of vessel members. *Trop. Woods* 41, 17.
13. — (1936). The distribution of the lengths of fibres and vessel members and the definition of terms of size. Imperial Forestry Institute Paper No. 2, Oxford. *Ref. Trop. Woods* 45, 1936, 49.
14. — and M. M. CHATTAWAY (1937). Identification of woods with included phloem. *Trop. Woods*, 50, 1.
15. — (1937). The phylogenetic value of certain anatomical features of dicotyledonous woods. *Ref. Trop. Woods* 52, 1937, 45.
16. — (1938). Standardization of terms for vesseldiameter and ray width. *Trop. Woods* 55, 16.
17. CHATTAWAY, M. M. (1932a). Proposed standards for numerical values used in describing wood. *Trop. woods* 29, 20—28.
18. — (1932b). Specialisation of the vertical wood parenchyma within the sub-family Sterculiaceae. *New Phytol.* 31, 119.
19. — (1933a). Tile cells in the rays of the Malvales. *New Phytol.* 32, 261.
20. — (1933b). Ray development in the Sterculiaceae. *Forestry* 7, 93.
21. CLARKE, S. H. (1938). A multiple entry perforated-card key with special reference to the identification of hardwoods. *New Phytol.* 37, 4, 369—374. *Ref. Trop. Woods* 57, 1939, 38.
22. DESCH, H. E. (1932). Numerical values for cell dimensions. *Trop. Woods* 29, 14.
23. FROST, F. H. (1930—31). Specialisation in secondary xylem of Dicotyledons. I Origin of vessel. II Evolution of end wall of vessel segment. III Specialisation of lateral, wall of vessel segment. *Botanical Gazette (Chicago)* 89, 1, 67—94, 1930; 90, 2, 198—212, 1930; 91, 1, 88—96, 1931. *Ref. Trop. Woods* 26, 1931, 42—44.
24. HAYATA, B. (1921). The natural classification of plants according to the dynamic system. *Icon. Plant. Formos.* 10, 97.
25. — (1928). *Proc. IIIrd Pan-Pacific Congress Tokyo 1926 (II, 1928), 1867—1886.*
26. — (1931). *Ber. d. Deutsch. bot. Ges.* 49, 328.
27. HEURN, F. C. VAN (1944). Voorstel, ten behoeve van de internationale edities der U.D.C. aangeboden aan de "Fédération Internationale de Documentation" Rubriek 674.03. Verschillende houtsoorten. "De Mercuur", Hilversum.
28. INTERNATIONAL ASSOCIATION OF WOOD ANATOMISTS (1933). Glossary of terms used in describing woods. *Trop. Woods* 36, 1.
29. — (1937). Standard terms of the length of vessel members and wood fibres. *Trop. Woods* 51, 21.
30. — (1939). Standard terms of size for vessel diameter and ray width. *Trop. Woods* 59, 52.
31. JANSSONIUS, H. H. (1931). Die Verteilung des Stockwerkartigen Aufbaues im Holz der Dikotyledonen. *Rec. Trav. Bot. Neerl.* 28, 97—106, 1931. *Ref. Trop. Woods* 28, 1931, 49—50.
32. KRIBS, D. A. (1937). Salient lines of structural specialisation in the wood parenchyma of dicotyledons. *Bull. Torrey Bot. Club* 64, 4, 177—187. *Ref. Trop. Woods* 54, 1938, 63.
33. LAM, H. J. (1938). On the relation of Taxonomy, Phylogeny and Biogeography. (*Studies in Phylogeny I*). *Blumea* 3, 114.
34. LECOMTE, H. (1923). Les bois coloniaux. (Edité dans la collection Armand Collin) Paris.
35. MOLL, J. W. und H. H. JANSSONIUS (1906—1936). *Mikrographie des Holzes der auf Java vorkommenden Baumarten.* Leiden.
36. NORMAND, D. (1934). Aperçu sur la systématique des bois. *Revue Internationale du Bois. (Paris)* 11, 15.
37. PERROT, E. (1921—'22). Essai d'identification des bois tropicaux. (Bois de Madagascar, de la Côte d'Ivoire et du Gabon). *Travaux du laboratoire de matière médicinale* 13, et 14.
38. PFEIFFER, J. PH. (1917). De waarde van het wetenschappelijk onderzoek voor de vaststelling van technische eigenschappen van hout. Thesis Delft. (Amsterdam).
39. — (1921). De classificatie van dicotyle boomsoorten op grond van den bouw en het uiterlijk van het secundaire hout volgens een decimaal systeem. (Inedit.).

40. — (1926a). De houtsoorten van Suriname. Mededeeling 22 Koloniaal Instituut Amsterdam.
41. — (1926b). De micrografische identificatie van hout. Naar aanleiding van het Proefschrift van J. R. Beversluis, Wageningen 1925. De Indische Mercur 49, 13, 224.
42. — (1932). Summary of investigations made in Holland and her colonies with respect to the description and the identification of woods, with a view to drawing up a method applicable in practice. Association internat. pour l'essai des matériaux. Congrès de Zurich 1931, p. 38.
43. RECORD, S. J. (1927). Occurrence of "ripple marks" in woods. Trop. Woods, 9, 13.
44. — (1931). The field of wood anatomy. Empire Forestry Journal (London) 10, 5—6. Ref. Trop. Woods 28, 1931, 55—56.
45. — (1932). Een nieuwe determinatiemethode by A. T. J. Bianchi. Trop. Woods 29, 53.
46. — (1934a). Identification of the timbers of temperate North America. New York. London.
47. — (1934b). Role of wood anatomy in taxonomy. Trop. Woods 37, 1—9.
48. — (1936a). Some Problems for the wood anatomists. Sixth International Botan. Congr. Proc. Amsterdam, 1, 224. Trop. Woods 44, 1935, 2.
49. — (1936b). Classification of various anatomical features of Dicotyledonous woods. Trop. Woods 47, 12.
50. — and M. M. CHATTAWAY (1939). List of anatomical features used in classifying Dicotyledonous woods. Trop. Woods 57, 11. (For the use of Bianchi's determination method).
51. RENDLE, B. J. and S. H. CLARKE (1934). The diagnostic value of measurements in wood anatomy. Trop. Woods 40, 27—37.
52. — (1935). Mikrographie des Holzes der auf Java vorkommenden Baumarten. By H. H. Janssonius. Trop. Woods 41, 49.
53. SANIO, C. (1863). Vergleichende Untersuchungen über die Elementarorgane des Holzkörpers. Bot. Zeit. 21, 85—128 und 358—412.
54. SWAIN, E. H. F. (1927). A universal index to wood. Queensland For. Serv. For. Bull. No. 7.
55. THONNER, F. (1917). Anleitung zum Bestimmen der Familien der Blütenpflanzen. Berlin.
56. TORREY, R. E. (1921). Telephragmoxylon and the origin of wood parenchyma. Ann. of Bot. 35, 73.
57. VAVILOV, N. I. (1922). The law of homologous series in variation. Journ. of Genetics 12, 47.
58. ZIMMERMANN, W. (1930). Die Phylogenie der Pflanzen. Jena.
59. ZIJLSTRA, K. (1909). Die Gestalt der Markstrahlen im sekundären Holz. Rec. Trav. Bot. Neerl. 5, 17.

B. Index of authors.

- | | |
|---|---|
| Beekman, H., p. 438, 441, 442, 446, 453, 554, 456, 458, 459, 461, 471. | Hayata, B., p. 484. |
| Berger, L. G. den, p. 438, 441, 442, 446, 453, 454, 456, 458, 459, 461, 471, 474. | Heurn, F. C. van, p. 446. |
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NOTES ON THE FLORA OF JAVA, II¹⁾

by

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Introduction.

In a previous number of this volume (Blumea V, nr. 1, 1942, p. 66—80), one of the junior writers of the present paper published an account of nomenclatorial changes concerning javanese *Verbenaceae*. This paper was written as a supplement to a larger work by the senior writer, who has for long years devoted most of his activities to the study of the flora of Java, on which it was his privilege to publish some more or less extensive papers, all of them in the Dutch language²⁾. These publications may be considered materials for a Flora of Java. In fact, some of them have the character and even the title of such a flora, though on account of several circumstances none of them could be completed.

Since the senior writer had retired from his official duties, an attempt was made to fill up this gap. For this purpose numerous scattered annotations were sorted and a start was made with the design of a reviewed and complete Flora of Java, again in Dutch. However, it soon became evident that this work was too extensive a task for a single man of my age and I therefore requested the help of the director of the Rijksherbarium at Leiden. Through his kind mediation the collaboration

¹⁾ I in Bull. Jard. bot. Buitenz., Sér. III, Vol. XVI², 1939, 107—110. Next to this the present paper has two other precursors which were published under different titles but which serve entirely the same purpose. They are:

J. Th. Koster, Notes on Malay Compositae — Blumea IV, No. 3, 1941, 482—492.
A. D. J. Meeuse, Notes on Javanese Verbenaceae — Blumea V, No. 1, 1942, 66—80.

²⁾ The more important of these are:

1. Flora van Batavia, I — *Dicotyledones*, *Dialypetalae*. Batavia, 1907.
2. Schoolflora voor Java, (*Ranunculaceae-Myrtaceae*). Weltevreden, 1911.
3. (with Dr D. F. van Slooten) Geïllustreerd Handboek der Javaansche Thee-onkruiden en hunne beteekenis voor de cultuur. Batavia, 1924.
4. Handboek voor de Flora van Java (part of *Pteridophyta*, *Cycadaceae*, part of *Monocotyledones*). Batavia, 1925—1928.
5. Onkruidflora der Javaansche Suikerrietgronden. Met Atlas. Soerabaja, 1934.
6. (with Dr O. Posthumus) Varenflora voor Java. Buitenzorg, 1939.

was procured of some junior assistants. In the first phase of the work financial support to this end was kindly granted, first by the "Maatschappij ter Bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën" and afterwards also by the "Korthalsfonds", managed by the Royal Netherlands' Academy of Sciences at Amsterdam and by "Greshoff's Rumphiusfonds". Prof. Dr A. A. Pulle, Utrecht, kindly took an interest in this work and lent his intermediary in procuring the greater part of the necessary funds. In a later stage, however, also the Government could be convinced of the importance of this work and of a rapid rate of its progress and first one, later on two assistants were added to the Staff of the Rijksherbarium with the special instruction to assist me in my work. Recently a third assistant was appointed at the Botanical Museum and Herbarium of the Utrecht University. I take pleasure to avail myself of this opportunity to tender my best thanks to Dr Pulle and to Dr Lam for their kind collaboration, as well as to the Societies and Foundations, whose generous help in the earlier phases of the work appeared to be vital for starting it.

However, as long as the whole MS. was not completed, it seemed unadvisable to start the printing of even those parts which may be considered finally concluded. Moreover, war conditions soon prevented the possibility of a printed publication. And as, during the progress of the war, the possibility of the destruction of the MS., of which no duplicate had been made, grew less and less imaginary, it was decided to issue a stencilled "Nooduitgave" (emergency edition) in a very limited number (30 copies). This was accomplished as the work proceeded; thusfar 10 fascicles have been published since November 1940. It is expected that another 7 or 8 will bring the work to an end.

During the preparation of this emergency edition several new species, varieties, forms or combinations had to be described, for which the "Nooduitgave" was not a suitable shelter. These are therefore published here and they will be continued as the work proceeds. Included are also such new localities as seemed to be of sufficient importance for our knowledge of the distribution of the various species. In each item the page both of the "Nooduitgave" (if the family concerned has already been published) and of the "Schoolflora" of 1911 has been referred to. The former has been quoted as N. Fl. and further by the number of the fascicle, in addition to that of the family and to that of the page, e.g.: N. Fl. III, fam. XXV, 12, means Fascicle (Aflevering) III, family nr. XXV, page 12. The "Schoolflora" has been cited as: Sch.fl.

ANNONACEAE, N. Fl. IIIa, fam. XXV.

(by C. A. Backer)

Uvaria schizocalyx Backer, nov. spec., N. Fl. IIIa, fam. XXV, 7 — *Frutex* scandens. Innovations dense breviterque ferrugineo-stellato-pubescentes. *Folia* oblonga vel ovato-oblonga, basi rotundata vel subcordata, apice obtuse vel acute breviterque acuminata, 160—220 mm longa, 60—90 mm lata, supra glabra, subtus sparsissime (in nervis paulo densius) erecto-stellato-pubescentia, nervis lateralibus utrinque 15—16 oblique adscen-

dentibus, petiolo dense ferrugineo-pubescente, 5—10 mm longo. *Flores* solitarii, pedicello 10—20 mm longo robusto, dense breviterque ferrugineo-stellato-pubescente, bracteola 5—8 mm supra basin inserta fugax. *Calyx* ante anthesin omnino clausus, deinde irregulariter 2—3-fidus, utroque latere dense breviterque stellato-pubescent, 8—10 mm longus. *Petala* 6 basi breviter connata carnosa ovata vel obovata obtusa, 20—25 mm longa, utrinque dense breviterque stellato-pubescentia. *Stamina* exteriora sterilia, dorsaliter applanata, oblongo-spathulata, basi angustata, apice plus minusve truncata, c. 7 mm longa, 2—2.5 mm lata, intus costa media conspicua percursa; stamina reliqua fertilia multiserialia, connectivo producto truncato crassiusculo 1.5—1.8 mm longo computato, 6—7 mm longa, antheris lateralibus. Torus alte conoideus glaber. *Ovaria* permulta densissime conferta dense breviterque pubescentia, stylo brevi computato 4.5—5 mm longa pluri-ovulata. *Bacca* adhuc ignota.

JAVA, Kedoe, Sempor (N.N.W. of Gombong), collected in a few specimens in brushwood on a riverbank, alt. 60 m: *Brinkman 862 A* (13-II-1938): type specimen in Herb. Hort. Bog.

This species differs from *U. purpurea* Bl. and from *U. hirsuta* Jack by the petals connected at the base and the sterile outer stamens and from *U. lampunga* Scheff. by the high cone-shaped receptacle during the flowering-time and the sterile outer stamens.

Anomianthus auritus (Bl.) Backer, nov. comb., N. Fl. IIIa, fam. XXV, 10; Sch.fl. 23 — *Uvaria aurita* Bl., Fl. Jav. Anon. 15 (1829 vel 1830).

Marsypopetalum pallidum (Bl.) Backer, nov. comb., N. Fl. IIIa, fam. XXV, 19; Sch.fl. 36 — *Gutteria pallida* Bl., Bijdr. 20 (1825); Fl. Jav. Anon. 97 (1830).

Mitrephora javanica Backer, nov. nom., N. Fl. IIIa, fam. XXV, 22; Sch.fl. 33 — *Mitrephora polypyrena* Auct., non Miq.

Meiogyne montana (Bl.) Backer, nov. comb., N. Fl. IIIa, fam. XXV, 26; Sch.fl. 29 — *Uvaria montana* Bl., Fl. Jav. Anon. 45 (1829 vel 1830) — *Meiogyne stipitata* Koord. & Val. in Meded. 's Lands Plantentuin, LXI, 305 (1903).

Polyaulax Backer, nov. gen., N. Fl. IIIa, fam. XXV, 26 — *Frutices* erecti. *Folia* subcoriacea nitida reticulato-venosa. *Flores* axillares solitarii, pedicello brevissimo squamato, alabastris conoideis. *Sepala* 3, basi vix connata triangularia. *Petala* 6 biserialia libera aestivatione valvata, omnia calyceem valde superantia, 3 exteriora primo oblique erecta denique patentia ovata acuta paulo carnosa; 3 interiora erecta ovato-oblonga crassissime carnosa, dimidio basali intus leviter excavata, multis sulcis irregularibus angustis satis profundis peraratis (unde nomen generis). *Torus* convexus inter stamina densissime breviterque erecto-pubescent. *Stamina* satis numerosa, cuneata, thecis oblique extrorsis, connectivo lato thecarum apices contegente truncato, glabro. *Ovaria* 6—8 libera dense adpresse longiuscule pubescentia, ovulis 6—7 uniserialibus, stigmatibus globoso vel oblongo glabro caduco. *Folliculi* 1—7 breviter stipitati teretes inter semina haud constricti, semina 4—7 uniserialia dense conferta, valde verticaliter compressa.

Polyaulax is most closely related to the Javanese genus *Ararocarpus* Scheff. (Ann. Jard. bot. Buitenz. II, 10, 1885) which has never been

retraced after Scheffer's time. This differs from *Polyaulax* by the inner petals which are much less carnose and not sulcate inside, as well as by the connate ovaries and fruits. In the shape of its flowers and in general habit *Polyaulax* recalls some species of *Polyalthia*, which is, however, distinguished by 1—2-ovulate ovaries.

Thus far only one species of *Polyaulax* is known. This has been described by Burek as *Mitrephora cylindrocarpa* Burek from S. New Guinea. At the time, only the fruits were known. Now that also flowering specimens have been collected, it is obvious that Burek's plant cannot belong to *Mitrephora* which is distinguished by inner petals which are distinctly unguiculate and whose tips are connected so as to form a cap over the genitalia. As the specimens from New Guinea and from Madoera seem to be conspecific Burek's species had to be renamed:

Polyaulax cylindrocarpa (Burek) Backer, nov. comb., N. Fl. IIIa, fam. XXV, 26 — *Mitrephora cylindrocarpa* Burek, Nova Guinea VIII, 433 (1911). *Frutex* multiramis 1—3 m altus. *Ramuli* minute pubescentes. *Folia* ovata vel oblonga vel lanceolata, basi cuneata vel rotundata, apice longe anguste acuminata, acuta vel subobtusa, adulta glabra (costa media et partibus adjacentibus subtus sparse adpresse longe ferrugineo-pubescentibus exceptis), 50—100 mm longa, 10—40 mm lata, novella rubra, petiolo 3—5 mm longo. *Flores* subfoetidi, pedicello 2—3 mm longo. *Sepala* 2—3 mm longa. *Petala* juvenilia viridia, provectiore aetate albolutea vel lutea, extus densiuscule adpresse breviter pubescentia, exteriora 10—15 mm longa, 4—7 mm lata, intus parte superiore densissime, parte inferiore minus dense adpresse breviter pubescentia, interiora 10—13 mm longa, 4—5 mm lata, intus parte superiore dense pubescentia, parte inferiore glabra. *Stamina* c. 1.75 mm longa. *Ovaria* subsessilia cylindracea, mucronulata, ferrugineo-tomentella glabrescentia. *Folliculi* 1—6 stipitibus usque ad 10 mm longis suffulti, 18—60 mm longi, 20 mm lati, semina plerumque uniseriata discoidea pro folliculo usque ad 9.

Madoera, Backer 19566, 21148 in Herb. Hort. Bog.

Description partly after living material.

Fissistigma sphaerocarpum (Miq.) Backer, nov. comb., N. Fl. IIIa, fam. XXV, 30 — *Melodorum sphaerocarpum* Miq., Ann. Mus. Bot. Lugd-Bat. II, 38 (1865—1866); Sch.fl. 32.

LAURACEAE, N. Fl. IIIa, fam. XXVII.

(by C. A. Backer)

Neolitsea javanica (Bl.) Backer, nov. comb., N. Fl. IIIa, fam. XXVII, 26 — *Litsea javanica* Bl., Ann. Mus. Bot. Lugd-Bat. I, 348 (1863—1864).

MENISPERMACEAE, N. Fl. IIIb, fam. XXXIV.

(by C. A. Backer)

Pycnarrhena montana Backer, nov. spec., N. Fl. IIIb, fam. XXXIV, 7 — *Frutex* scandens, caule sinistrorsum volubili longitudinaliter striato-costato, partibus vetustioribus nigris glabris. *Folia* oblonga vel ovato-oblonga, basi obtusa vel rotundata, apice obtuse acuminata, mucronulata,

marginibus anguste translucentibus paulo incrassatis, in sicco papyracea, 55—120 mm longa, 20—50 mm lata, supra glabra, subtus (costa sparse adpresse breviter pubescente excepta) glabra, costa media utrinque (praecipue subtus) valde prominens, nervi laterales 4—8 arcuatim adscendentes in sicco subtus prominentes, reticulatione in sicco supra vix, subtus conspicue prominente, petiolo 10—20 mm longo, adpresse breviter pubescente. *Flores* ♀ ignoti; florum ♂ fasciculi in axillis foliorum delapsorum in verrucis positi 10—30-flori, flores perfragrantes, pedicellis simplicibus minute adpresse pubescentibus 5—10 mm longis. *Sepala* interiora 2.5—3 mm diametro. *Petala* 3, apice late rotundata, 1.25—1.5 mm longa, 1.75—2 mm lata. *Stamina* 12. *Fructus* ignoti.

JAVA, W. Java, on Mt. Telagabodas near Pangentjongan, above 1000 m alt.: Koord. 26732 β: type specimen in Herb. Hort. Bog. [in Koorders, Syst. Verz. mentioned as *P. cauliflora* (Miers) Diels]. Flowering specimen collected 21-I-1897.

Relationship with other species can be studied in the monograph of the *Menispermaceae* by Diels in Engl. Pflanzenr., Menisperm., 1910. The two other Javanese species *P. cauliflora* (Miers) Diels and *P. lucida* (T. & B.) Miq. possess 9 stamens in the male flower.

THYMELAEACEAE, N. Fl. IVa (2), fam. LXXXVII.

(by C. A. Backer)

Phaleria parvifolia Backer, nov. spec., N. Fl. IVa (2), fam. LXXXVII, 2 — *Arbor* ? *Frutex* ? *Ramuli* glabri. *Folia* oblonga, basi cuneata acuta, apice angustata acuta vel obtusiuscula, glabra, 35—45 mm longa, 10—15 mm lata, costa media valida subtus prominens, nervis lateralibus reticulationeque tenuibus, foliorum normalium catervis alternantibus cum catervis foliorum multo minorum. *Capitula* terminalia vel in axillis foliorum superiorum posita breviter pedunculata, basi involuero 4-foliato cineta, involucri folia c. 7.5 mm longa ovalia vel ovali-obovata, dorso in parte basali glabra, in parte apicali densiuscule adpresse pubescentia, intus in costa media, marginum partibus apicalibus, apiceque minute pubescentia. *Flores* in capitula plures, sessiles. *Perianthii* tubus basi apiceque dilatatus 10—12 mm longus utroque latere densiuscule pilosus, pilis albis erectis; fauce inter staminum 4 epitepalium bases totidem squamis brevissimis latis subcrenato-dentatis glabris minuta; lobi oblongi obtusi intus glabri 5—6 mm longi. *Staminum* filamenta 8 prope fauce perianthii inserta distincte biserialia, superiora epitepalia, c. pro 7.5 mm exserta. *Stylus* quam stamina multo longior, c. pro 12.5 mm exsertus, stigmate crasse globoso; discus cupuliformis ovarii dimidiam partem inferiorem includens, margine paulo irregulariter dentatus. *Ovarium* glabrum 2-loculatum, loculi uniovulati, ovula pendula. *Drupa* ignota.

JAVA, E. Java, Kali Baroe: *A. Rant* s.n. (VI-1933): type specimen in Herb. Hort. Bog.

The specimen collected by Dr Rant is the only one known. It was found cultivated on the premises of an hotel. The native country of the species is unknown.

Wikstroemia calva Backer, nov. nom., N. Fl. IVa (2), fam. LXXXVII, 4 — *Wikstroemia Junghuhniana* Koord. & Val. (sphalmate), Bijdr. Booms.

Java XIII, 58 (1914) [nec *Wikstroemia Junghuhnii* Miq., Fl. Ind. Bat. I, I, 879 (1860); N. Fl. IVa (2), fam. LXXXVII, 5].

The name given by Koorders and Valetton was a mistake, hence it cannot be accepted. Obviously they intended to identify their plant as *W. Junghuhnii* Miq. Unfortunately their specimen does not belong to this species either, differing from it by a completely glabrous ovary tip (also in young flowers). This is why we choose the specific name of *calva*. For the rest, also the name *W. Junghuhnii* Miq. is not valid, being a synonym of *Wikstroemia androsaemifolia* Deene.

CUCURBITACEAE, N. Fl. IVb, fam. LXXXVIII.

(by A. D. J. Meeuse)

Gymnopetalum cochinchinense (Lour.) Kurz in Journ. As. Soc. Beng. XL, II, 57 (1871); N. Fl. IVb, fam. LXXXVIII, 19 — *Gymnopetalum quinquelobum* Miq., Fl. Ind. Bat. I, I, 681 (1855).

The last-named species is described as possessing distinctly incised leaf margins (cf. the remark under the following species).

Trichosanthes grandiflora Bl., Bijdr. 934 (1826); N. Fl. IVb, fam. LXXXVIII, 23 — *Trichosanthes globosa* Bl., l.c. 936.

The first-named species has entire or shallowly incised leaves but this appears insufficient to make it specifically different from *T. globosa*. Similar cases are represented by *Gymnopetalum cochinchinense* (Lour.) Kurz and *Coccinea cordifolia* (L.) Cogn.

Gymnostemma pedatum Bl., Bijdr. 23 (1825); N. Fl. IVb, fam. LXXXVIII, 26 — *Gymnostemma laxum* (Wall.) Cogn. in DC., Mon. Phan. III, 914 (1881).

The last-named is sometimes but incorrectly kept apart on account of its trifoliolate leaves.

MYRTACEAE, N. Fl. IVb, fam. XCVIII.

(by G. J. H. Amshoff)

By accepting the delimitation of the genus *Syzygium* Gärtn., as given by Merrill and Perry in 1939 (The Myrtaceous Genus *Syzygium* in Borneo, Mem. Ac. Arts and Sci. XVIII, part 3) several new combinations become necessary for the Flora of Java. The delimitation may be not quite satisfactory (if a quite satisfactory delimitation of *Eugenia* L. and allied genera is realisable at all), but it has great practical advantages.

Cleistocalyx operculatus (Roxb.) Merr. et Perry in Journ. Arn. Arb. 18, 337 (1937); N. Fl. IVb, fam. XCVIII, 7 — *Eugenia operculata* Roxb., Fl. Ind. ed. 2, 2, 486 (1832); Koord. & Val., Booms. Java VI, 148 (1900); Sch.fl. 504.

To this species probably also belongs the specimen named *Eu. occlusa* Kurz by Koorders and Valetton Booms. Java VI, 152; Sch.fl. 504.

Among the synonyms cited by Merrill and Perry l.c., *Syzygium angolanum* Miq. has to be dropped. This is, according to the type specimen in Herb. Utr., a species identical with or very nearly allied to *S. javanicum* Miq. sensu Merr. et Perry. *Syzygium costatum* Miq., 1855 (Java) is also, owing to incorrectly named old specimens, often cited among the synonyms

of *Cl. operculatus*. The type specimen is also in the Utrecht Herbarium. At present I can only say that it is nearly allied to *S. racemosum* (Bl.) DC., but it shows the venation of *S. laxiflorum* (Bl.) DC. [*Eugenia laxiflora* (Bl.) Koord. et Val., non Poir.] and it is much more robust.

Eugenia intermedia Koord. et Val., Booms, Java VI, 116 (1900) (non Berg, 1854); Sch.fl. 512.

Insufficiently known, much resembling *S. oblatum* (Roxb.) Cowan.

Eugenia pendula (Bl.) DC., Prodr. III, 284; Koord et Val., Booms. Java VI, 83 (1900); Sch.fl. 501.

This species was apparently collected in Amboina, not in Java.

Syzygium Macromyrtus (Koord. et Val.) Merr. et Perry in Mem. Ac. Arts and Sci. XVIII, 3, 168 (1939) (quoad nomen, non quoad syn. et spec. citata); N. Fl. IVb, fam. XCVIII, 10 — *Macromyrtus javanica* Miq., Fl. Ind. Bat. I, 439 (1855) — *Eugenia Macromyrtus* Koord. et Val., Booms. Java VI, 109 (1900); Sch.fl. 518.

This species is known from Java only; it differs from specimens¹) from Sumatra and Borneo ascribed to it by Merrill and Perry i.e. (who followed determinations made at Buitenzorg) by the 8 minute sepals, the receptacle being very abruptly narrowed into a long and slender pseudostipe (apex of the flower bud subglobose) and the apparently terminal inflorescence. Both species belong to a group (*Macromyrtus* Miq. as a genus), characterized by their clavate flowers and biseriate ovules. Other members of this group in Java are: *S. attenuatum* (Miq.) Merr. et Perry (*Eugenia leptocalyx* Val., nom. nud.), *S. clavatum* (Korth.) Merr. et Perry, *S. teretiflorum* (Koord. et Val.) Amsh. and *S. ruminatum* (Koord. et Val.) Amsh. *S. Macromyrtus* and *S. siphonanthum* are remarkable for the position of the ovary at the middle (not at the apex) of the solid part of the receptacle.

Syzygium teretiflorum (Koord. et Val.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 11 — *Eugenia teretiflora* Koord. et Val., Booms. Java VI, 119 (1900); Sch.fl. 518.

Known to me from the description only.

Syzygium ruminatum (Koord. et Val.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 11 — *Eugenia ruminata* Koord. et Val., Booms. Java VI, 117 (1900); Sch.fl. 513.

Very closely allied to the following species and perhaps not sharply distinct, but with tetragonous branchlets and chartaceous leaves.

Syzygium clavatum (Korth.) Merr. et Perry in Mem. Ac. Arts and Sci. XVIII, 3, 180 (1939); N. Fl. IVb, fam. XCVIII, 11 — *Jambosa clavata* Korth. in Ned. Kruidk. Arch. I, 201 (1847) — *Jambosa melanocarpa* Miq., Fl. Ind. Bat. I, I, 439 (1855).

Java, Karimoendjawa islands: Karta 377, distributed as *Eugenia claviflora* Roxb.

Already known from Borneo, Palawan and Sumatra, Lampongs (*Zollinger s.n.*, type specimen of *J. melanocarpa* Miq. in Herb. Lugd. Bat.).

¹) These specimens have therefore to be named *S. siphonanthum* (King ex Greves) Amsh., nov. comb. (*Eugenia siphonantha* King ex Greves, Journ. Bot. LXII, Suppl. 38 (1924)).

Syzygium zeylanicum (L.) DC., Prodr. III, 260 (1828); Merr. et Perry in Mem. Ac. Arts and Sci. XVIII, 3, 159 (1939); N. Fl. IVb, fam. XCVIII, 13 — *Myrtus zeylanica* L., Sp. Pl. 472 (1753) — *Eugenia spicata* Lamk., Encycl. III, 472 (1789); Sch.fl. 509 — *Jambosa rostrata* Miq., Fl. Ind. Bat. I, I 436 (1855).

This species, as delimited by Merrill and Perry l.c. ("Flowers pustular or somewhat verrucose"), is apparently not found in Java (*Jambosa rostrata* Miq. was, according to the label on the type duplicate in Herb. Lugd. Bat., collected in Sumatra, not Java). *Eugenia spicata* Lamk., mentioned by Koorders and Valeton, Booms. Java VI, 122 (1900), is apparently identical with *S. antisepticum* (Bl.) Merr. et Perry ("Flowers smooth or minutely pustular, mostly longitudinally wrinkled", Merr. & Perry l.c. 142; syn. *Eugenia cuprea* Koord. et Val.).

Syzygium glomeruliferum Amsh., nov. nom.; N. Fl. IVb, fam. XCVIII, 14 — *Eugenia glomerata* Koord. et Val., Booms. Java VI, 91 (1900) (non Lamk. 1789 nec Spring 1837 nec *Syzygium glomeratum* [Lamk.] DC. 1828; Sch.fl. 503).

Syzygium microcymum (Koord. et Val.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 15 — *Eugenia microcyma* Koord. et Val., Booms. Java VI, 92 (1900); Sch.fl. 505.

Known to me from the description only.

Syzygium decipiens (Koord. et Val.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 16 — *Eugenia decipiens* Koord. et Val., Booms. Java VI, 131 (1900); Sch.fl. 502.

Syzygium myrtifolium (Roxb.) DC., Prodr. III, 261 (1828), nom. nud.; Walp., Rep. 2, 178 (1843); Merr. & Perry, Mem. Ac. Arts and Sci. XVIII, 3, 182 (1939); N. Fl. IVb, fam. XCVIII, 16.

Java, N.E. of Buitenzorg, numerous: Backer 31109 (BZ).

New for Java; a narrow-leaved form.

Syzygium acutatum (Miq.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 17 — *Jambosa acutata* Miq., Fl. Ind. Bat. I, I, 432 (1855) — *Eugenia argutata* Koord. et Val. Booms. Java VI, 146 (1900); Sch.fl. 512.

Imperfectly known.

Syzygium pachyrrachis Amsh., nov. spec.; N. Fl. IVb, fam. XCVIII, 18 — *Arbor. Ramuli novelli tetragoni crassi. Folia elliptico-oblonga coriacea glabra, 70—130 mm longa, 30—50 mm lata, apice acuminata acumine recurvato, basi acuta vel interdum obtusa, costa supra impressa subtus elevata, nervis lateralibus primariis quam secundarii distincte robustioribus, utrinque praesertim subtus prominulis, venis subtus laxe reticulatis, nervo intramarginali 1—1.5 mm a margine distante, petiolo 10—15 mm longo. Inflorescentiae terminales corymbosae amplae densiflorae, floribus sessilibus in apice ramulorum glomeratis, ramulis crassis tetragonis applanatis, leviter sulcatis. Receptaculum abrupte in pseudostipitem contractum \pm 5 mm altum, limbo indistincte lobato. Corolla calyptрата. Stamina numerosa in disco angusto inserta. Ovarium 2-loculare, ovulis pro loculo 10, in placenta peltata dispositis. Drupa (unica visa) globosa \pm 20 mm diametiens; cotyledones ignotae.*

Java, Without locality: *Pl. Jungkuhiense ineditae 252* (flow. and fr.): type specimen in Herb. Lugd. Bat.; Priangan, Tjibodas: *Sapiin 2204* (flow.) in Herb. Lugd. Bat. and Herb. Utr.; Tjadasmalang near Tjidadap, alt. 1000 m: *Winckel 1183* (flow. on 20-III-1913) in Herb. Lugd. Bat., distributed as *Eugenia operculata* Roxb.

In the last-cited specimens, the flowers are staminate only, the ovary being rudimentary. The species is nearly allied to the polymorphous *S. racemosum* (Bl.) DC., but apparently sharply distinct by its tetragonous brachlets and corymbose inflorescences.

Syzygium pyrifolium (Bl.) DC., Prodr. III, 260 (1828); N. Fl. IVb, fam. XCVIII, 18 — *Calyptranthes pyrifolia* Bl., Bijdr. 1090 (1826) — *Syzygium truncatum* Miq., Fl. Ind. Bat. I, I, 455 (1855) — *Eugenia javensis* Koord. et Val., Booms. Java VI, 142 (1900) (incl. ? *Syzygium javanicum* Miq.) — *Eugenia salaccensis* Koord. et Val. l.c. 144 (based on *C. pyrifolia* Bl.) — *Eugenia striata* Koord. et Val. l.c. 145; Sch.fl. 511 (based on *S. truncatum* Miq.).

This Javanese form, especially the type specimen of *S. truncatum* Miq., is in better agreement with *S. oblatum* (Roxb.) Cowan than with the species, distinguished for the Malay Peninsula as *E. pyrifolia* (Bl.) Duthie, 1878 (non Desv., 1825). In the last-named species, the flowers are more slender.

The position of *S. javanicum* Miq. is quite doubtful. The type specimen consists of a leaf and a fragment of a young inflorescence only. Merrill and Perry l.c., 188, apparently interpreted the species after a second specimen cited by Miquel in Fl. Ind. Bat. Suppl. I, 312 (1862), but as was already stated by Koorders and Valeton l.c. 142, there are no Javanese specimens quite agreeing with this specimen from Banka. Among the synonyms cited by Merrill and Perry l.c., *S. euneuron* Miq. at any rate has to be dropped; this is quite a distinct species with open venation. Merrill and Perry apparently saw an incorrectly named specimen.

Syzygium racemosum (Bl.) DC., Prodr. III, 261 (1828); Merr. & Perry, Mem. Ac. Arts and Sci. XVIII, 3, 189 (1939); N. Fl. IVb, fam. XCVIII, 19 — *Eugenia jamboloides* Koord. et Val., Booms. Java VI, 136 (1900); Sch.fl. 512 (non quoad syn: *Eugenia javensis* Koord et Val. et *E. salaccensis* Koord. et Val., cf. preceding species) — *Syzygium Zippelianum* Miq., Fl. Ind. Bat. I, I, 449 (1855) — *Eugenia Zippeliana* (Miq.) Koord. et Val. l.c. 142.

A very polymorphic and puzzling species, all attempts for the classification of these forms having thus far been unsuccessful. For the Flora of Java, I have provisorily restricted *S. racemosum* to those forms with relatively small flowers and the receptacle abruptly narrowed into the pseudostipe. In the type specimen of *S. Zippelianum*, the leaves are more reticulate and the bracts more developed than in *S. racemosum*. The type specimen of *S. racemosum* (Bl.) DC. is not quite characteristic for the species as commonly interpreted and has moreover very young inflorescences only.

The much rarer form with larger flowers and \pm obconic receptacle I have provisorily named *Syzygium pyrifolium* (Bl.) DC.

Syzygium Winckelii Amsh., nov. spec.; N. Fl. IVb, fam. XCVIII, 20 — *Arbor. Ramuli novelli teretes grisei. Folia oblonga coriacea glabra, apice acuminata, basi acuta vel obtusa, 150—170 mm longa, 30—60 mm lata, glandulis inconspicuis, costa supra impressa subtus elevata, nervis lateralibus utroque latere 10—16 subtus valde prominentibus arcuatim conjunctibus, nervo intramarginali \pm 3 mm a margine remoto, petiolo \pm 10 mm longo canaliculato nigrescente. Inflorescentiae valde abbreviatae axillares et latera-*

les, rhachide ± 5 mm longa. *Alabastro sessilia pyriformia* ± 9 mm longa, apice ± 5 mm lata. *Receptaculum obconicum* ± 7 mm longum. *Sepala* in alabastro valde imbricata rotundata mox decidua, 2 exteriora ± 2 mm longa, 2 interiora ± 4 mm longa. *Petala libera*. *Antherae ovatae*. *Ovarium* biloculare, stylo usque ad 8 mm longo. Ovulis in utroque loculo ± 10 , pendentibus. *Fructus* ignotus.

Java, Priangan, Tjadasmalang near Tjidadap, alt.: 1000 m: *Winckel 1177* β (flow. on 1-XI-1923): type specimen in Herb. Lugd. Bat., duplicate in Herb. Utr.

This specimen was distributed as *Eugenia opaca* Koord. et Val. (non Berg!) [= *Syzygium splendens* (Bl.) Merr. et Perry]. As a matter of fact the flowers much resemble those of *S. splendens*, but in the latter the inflorescences are paniculate; the venation also is slightly different.

Syzygium confertum (Korth.) Merr. et Perry in Mem. Ac. Arts and Sci. XVIII, 3, 177 (1939); N. Fl. IVb, fam. XCVIII, 20 — *Jambosa conferta* Korth. in Ned. Kruidk. Arch. I, 202 (1847) — *Eugenia densepunctata* Koord. et Val., Booms. Java VI, 97 (1900); Sch.fl. 507 — *Eugenia Calvinii* Elm., Leaflets Philipp. Bot. 4, 1419 (1912) (fide Merrill and Perry, l.c.).

Java, Bantam, Tjimara, Oedjong Koelon, alt.: ± 100 m: *Koorders 5730* β (fl. in VII): duplicate of type of *E. densepunctata* Koord. et Val. in Herb. Lugd. Bat.; Central Java, Karanganyar, alt.: ± 200 m: *For. Exp. Sta. Ja. 2525* (fr. in XII).

Already known from Borneo, Palawan and Sumatra, Palembang (For. Exp. Sta. bb. F. 412). *E. densepunctata* Koord. et Val. was still kept distinct by Merrill and Perry l.c., on account of the pellucid-punctate leaves and the slightly larger flowers. The older leaves, however, are not pellucid-punctate and the flowers are smaller than in *E. Calvinii* Elm. Like in the fruiting specimens from Borneo, the fruit, as is the receptacle, is distinctly stipitate. By this character, fruiting specimens can be distinguished from the nearly allied, imperfectly known *S. splendens* (Bl.) Merr. et Perry (*Eugenia opaca* Koord. et Val. 1900 [non Berg 1857]; Sch.fl. 506).

Syzygium ampliflorum (Koord. et Val.) Amsl., nov. comb.; N. Fl. IVb, fam. XCVIII, 21 — *Eugenia ampliflora* Koord. et Val., Booms. Java VI, 107 (1900); Sch.fl. 510 — *Clavimyrthus firma* Bl., Mus. Bot. Lugd. Bat. I, 116 (1849) — *Jambosa firma* (Bl.) Miq., Fl. Ind. Bat. I, I, 439 (1855) (non Blume 1849) — *Eugenia firma* (Bl.) Koord. et Val., Booms. Java VI, 163 (1900) (sub speciebus dubiis) (non DC. 1828 nec *Syzygium firmum* Thw., 1864).

The type specimen of *C. firma* Bl. could not be traced, but a specimen in the Rijksherbarium, quite corresponding to Blume's description, has been named *Jambosa firma* Miq. The form of the staminal disc does not seem to me as sharply distinct from that of *S. lineatum* (DC.) Merr. et Perry [*Eugenia lineata* (DC.) Duthie, 1878 (non DC., 1828); Sch.fl. 510], as suggested by Koorders and Valetton.

Syzygium lineatum (DC.) Merr. et Perry in Journ. Arn. Arb. 19, 109 (1938) and in Mem. Ac. Arts and Sci. XVIII, 3, 172 (1939); N. Fl. IVb, fam. XCVIII, 22 — *Eugenia lineata* (DC.) Duthie in Hook.f., Fl. Brit. Ind. 2, 487 (1878); Koord. et Val., Booms. Java VI, 114 (1900); Sch.fl. 510 — ? *Myrtus cerasiformis* Bl., Bijdr. 1087 (1826) — *Jambosa cerasiformis* (Bl.) Hassk., Cat. Hort. Bog. Alt. 262 (1844); Miq., Fl. Ind. Bat. I, I, 433 (1855) — *Syzygium cerasiformis* (Bl.) Merr. et Perry, l.c. 187 (quoad nomen).

It does not seem advisable to follow Merrill and Perry's interpretation of *Myrtus cerasiformis* Bl., the less so as they write: "We regret that we are not able to throw much light on it". It is doubtful whether the presumed isotype in the New York Herbarium is really the isotype. In the Rijksherbarium there is a specimen of *S. lineatum* named *Myrtus cerasiformis* Bl., but Blume's original label (or the original specimen) has got lost. Koorders and Valetton believed that *Myrtus cerasiformis* Bl. was a synonym of *S. lineatum*, and, also judging from Blume's description, this seems the best disposition of it.

Syzygium Suringarianum (Koord. et Val.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 22 — *Eugenia Suringariana* Koord. et Val., Booms. Java VI, 86 (1900); Sch.fl. 521.

Syzygium gracile (Korth.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 22 — *Jambosa gracilis* Korth. in Ned. Kruidk. Arch. I, 202 (1847) — *Myrtus glabrata* Bl., Bijdr. 1088 (1826) (non Sw., 1788) — *Clavimyrthus virens* Bl., Mus. Bot. Lugd. Bat. I, 114 (1849) — *Clavimyrthus marginata* Bl. l.c. — *Jambosa marginata* (Bl.) Miq., Fl. Ind. Bat. I, I, 428 (1855) — *Eugenia Blumeana* O. K., Rev. Pl. I, 239 (1891) — *Jambosa virens* (Bl.) Miq. l.c. — *Eugenia virens* (Bl.) Koord. et Val., Booms. Java VI, 113 (1900) — *Eugenia Clavimyrthus* Koord. et Val. l.c.; Sch.fl. 521.

Syzygium pycnanthum Merr. et Perry in Mem. Ac. Arts and Sci. XVIII, 3, 168 (1939), sensu lat.; N. Fl. IVb, fam. XCVIII, 24 — *Eugenia densiflora* (Bl.) Duthie in Hook.f., Fl. Brit. Ind. 2, 473 (1878); Koord. et Val., Booms. Java VI, 57 (1900); Sch.fl. 519 — *Eugenia axillaris* Koord. et Val., Booms. Java VI, 60 (1900) (non Willd. 1790) — *Jambosa pseudodensiflora* Hochr. in Candolleo II, 425 (1925).

Through the kindness of Prof. Hochreutiner, I could examine a photograph, a flower and a leaf of the type of *J. pseudodensiflora*. *Syzygium pycnanthum* Merr. et Perry s.l. is indeed very variable in the size of the flowers; yet the small-flowered Java specimens are apparently not referable to *S. Focworthianum* (Ridley) Merr. et Perry, as the size of the flowers is not in correlation with the form of the leaf.

Syzygium umblicatum (Koord. et Val.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 24 — *Eugenia umblicata* Koord. et Val., Booms. Java VI, 63 (1900); Sch.fl. 520.

Syzygium discophorum (Koord. et Val.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 25 — *Eugenia discophora* Koord. et Val., Booms. Java VI, 61 (1900); Sch.fl. 521.

Syzygium littorale (Bl.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 26 — *Jambosa littoralis* Bl., Mus. Lugd. Bat. I, 102 (1849); Hallier f. in Med. 's Rijksherb. 12, 28 (1912) — *Eugenia subglauca* Koord. et Val., Booms. Java VI, 68 (1900); Sch.fl. 516.

Syzygium Vrieseanum (Miq.) Amsh., nov. comb.; N. Fl. IVb, fam. 27 — *Jambosa Vrieseana* Miq., Fl. Ind. Bat. I, I, 424 (1855) — *Eugenia Vrieseana* (Miq.) Koord. et Val., Booms. Java VI, 75 (1900); Sch.fl. 522.

This species was known to Koorders and Valetton from sterile material only, but among the type collection in the Rijksherbarium there is a well-preserved flowering specimen. It is evidently nearly allied to *Eu. poly-petala* Wight, Icon. II, t. 610 (1840—'43), but the inflorescence is very

shortly peduncled and there are four petals. The species is known from the type collection only.

Syzygium Zollingerianum (Miq.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 27 — *Jambosa Zollingeriana* Miq., Fl. Ind. Bat. I, I, 424 (1855) — *Eugenia Zollingeriana* (Miq.) Koord. et Val., Booms. Java VI, 75 (1900); Sch.fl. 522.

The var. *abbreviata* Koord. et Val. l.c. is not known to me.

Syzygium inopinatum Amsh., nov. spec.; N. Fl. IVb, fam. XCVIII, 28 — *Frutex arborescens* vel *arbor parva*, 3—7 m alta. *Ramuli* novelli teretes vel internodiis ultimis supra 4—6-goni brunnei. *Folia* opposita vel ternata oblonga vel oblongo-lanceolata, apice acuta vel acuminata, basi acuta vel interdum rotundata, coriacea, supra punctata, 60—200 mm longa, 20—70 mm lata, costa supra impressa subtus elevata, nervis lateralibus utroque 8—12 supra subimpressis, subtus prominentibus, arcuato-confluentibus, venulis subtus reticulatis subinconspicuis, petiolo nigrescente 3—5 mm longo. *Inflorescentiae* terminales et axillares interdum laterales, semper pauciflorae, floribus terminalibus ternatis, caeteris saepe singulis, rhachide acute tetragona 10—20 mm longa. *Alabastra* pyriformia usque ad 25 mm longa, apice 10 mm lata. *Receptaculum* in pseudostipitem brevem crassum contractum. *Sepala* inaequalia late rotundata viridia, exteriora 4—5 mm, interiora 6—7 mm longa. *Petala* 4 alba glandulosa 6—8 mm longa. *Stamina* numerosa alba 17.5—20 mm longa, antheris oblongis. *Ovarium* 2-loculare; ovulis numerosis in placenta peltata prominente dispositis, stylo 25—30 mm longo. *Fructus* maturus ignotus.

JAVA, Res. Batavia, Tjitjadas, alt.: \pm 100 m: *Van Steenis* 5408 (flow. on 18-VI-1933): type specimen in Herb. Hort. Bog., also distributed by Buitenzorg to B, K, L, SING. and to E. D. Merrill; Buitenzorg: *Boertlage s.n.* (flow. on 29-XII-1888) in Herb. Lugd. Bat.; Buitenzorg, Tegal Sapi: *R. C. Bakhuizen van den Brink* f. 3128 (immature fr. on 3-I-1924) in Herb. Utr.

Allied to *S. sexangulatum* (Miq.) Amsh., but differing by its ternate flowers and by the form of the receptacle (the pseudostipe is wanting in *S. sexangulatum*).

Syzygium sexangulatum (Miq.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 28 — *Jambosa sexangulata* Miq., Fl. Ind. Bat. I, I, 423 (1855) — *Eugenia sexangulata* (Miq.) Koord. et Val., Booms. Java VI, 79 (1900); Sch.fl. 514.

Syzygium aemulum (Bl.) Amsh., nov. comb.; N. Fl. IVb, fam. XCVIII, 28 — *Jambosa aemula* Bl., Mus. Bot. Lugd. Bat. I, 99 (1849) — *Eugenia aemula* (Bl.) Koord. et Val., Booms. Java VI, 76 (1900) (non Diels, 1907); Sch.fl. 522.

Imperfectly known species, nearly allied to *S. sexangulatum* (Miq.) Amsh., but with terete branchlets and smaller flowers.

Several *Syzygium*-species described from Java are still imperfectly known. Of *S. subcapitellatum* Miq., *Jambosa Horsfieldii* Miq. (no type specimen extant) and *J. polyneura* Miq. the type specimen is very fragmentary or quite absent; these species can best be neglected altogether. *Eugenia bantamensis* Koord. et Val. also could not be inserted in the Flora van Java, as its inflorescence is unknown.

Tristania Bakhuizeni Backer, nov. spec.¹⁾; N. Fl. IVb, fam. XCVIII, 33 — *Arbor* 20—50 m alta, trunco recto cylindrico, cortice griseo, longis pannulis secedente, ligno duro rubro. *Ramuli* acute angulati, minute adpresse pubescentes. *Folia* remota brevipetiolata vel subsessilia, novella rubida minute adpresse pubescentia, adulta glabrescentia coriacea, valde variabilia, in arboribus juvenilibus 120—350 mm longa, 25—55 mm lata, lanceolata vel lanceolato-obovata, basi longe angustata satis profunde sagittata vel subeordata interdum amplexicaulia lobis basalibus 2.5—17.5 mm longis, apice subabrupte obtuse acuminata vel obtusa, in arboribus vetustioribus 60—130 mm longa, 15—35 mm lata, basi subeordata vel rotundata vel acuta, apice obtuse acuminata; nervi secundarii paulo prominentes permulti, paralleli inter sese 3.5—5 mm distantes oblique adscendentes, uniti nervo intramarginali conspicuo a margine revoluti c. 1 mm distante; petioli usque ad 7.5 mm longi. *Inflorescentiae* cymosae pedunculatae, pedunculi 25—40 mm longi breviter pubescentes ramificationibus brevibus apice nonnullos flores confertos gerentes. *Calycis* tubus obconoideus c. 3 mm altus perminute pubescens, lobi late triangulares acuti 1.3—2 mm longi fimbriati, post anthesin stellatim patentes. *Petala* brevissime unguiculata, laminis rotundis c. 2 mm diametientibus. *Stamina* fasciculata c. 3 mm longa, pro fasc. c. 10 inaequalia. *Ovarium* apice liberum convexum minute pubescens, stylo c. 4 mm longo basi pubescente. *Fructus* seminaque adhuc ignoti.

J a v a, Buitenzorg, above Nangela, S.W. of Leuwiliang, alt.: 750 m: *Bakhuizen van den Brink* 7752 (flow. on 27-XII-1930): type specimen in Herb. Hort. Bog. (flow. in liq.), duplicate in Herb. Lugd. Bat. (without flowers), distributed as *T. Maingayi* Duthie; probably from same locality: *Bakh. v. d. Br.* 7753 in Herb. Hort. Bog. (flow. in liq.), distributed as *T. spec.*

The present species is thus far only known from the forest on the northwestern foothills of Mt Salak at an altitude of 500—900 m, where it is locally abundant.

It is closely related to *T. obovata* Benn. from Sum a t r a, B a n g k a, B i l i t o n and B o r n e o, a species showing quite similar juvenile forms. However, *T. obovata* preferently grows in brackish and peaty swamps as well as in the adjacent very barren and often periodically inundated sandy grounds below 200 m alt. Apart from the considerable difference in habitat, it seems to be advisable, for the time being, to keep the two species separate, not only on account of the difference in the length of the style — a fairly trifling character — but also of the fact that the fruits and seeds of *T. Bakhuizeni* are thus far unknown.

According to a communication by Van Steenis, to whom we owe the draft of the above description, it is presumed that the present species, in spite of some minor differences, might also be identical with *Tristania acutiauris* (Boerl. et Koord.) Beum. (= *Campsonoura acutiauris* Boerl. et Koord.) from Sumatra, of which only one sterile specimen (the type specimen) is known.

¹⁾ Received from Dr Van Steenis, Buitenzorg, under the name of *Tristania sagittata*.

TILIACEAE, N. Fl. IVb, fam. CV (exc. *Elaeocarpus*).

. (by A. G. L. Adelbert)

Grewia Microcos L., Syst. ed. XII, 602 (1767); N. Fl. IVb, fam. CV, 19; Sch.fl. 149 — *Grewia paniculata* Roxb., Hort. Beng. [93], (1814); Fl. Ind. II, 591 (1824); Sch.fl. 150.

Although I could not examine the type specimens of these two species, I venture the proposal of combining them, since they seem to be connected by numerous intermediate forms, particularly as concerns the indumentum. Many specimens quoted by Burret (Notizbl. Bot. Gart. Berl. IX, 773 s.s. 1926) could be studied by me and I found that the points of discrimination given in literature often fail to allow an identification of a given specimen.

Grewia retusifolia Kurz in Journ. As. Soc. Beng. XLI, II, 294 (1872); Burret in Notizbl. Bot. Gart. Berl. IX, 716 (1926); N. Fl. IVb, fam. CV, 19.

Java, Res. Soerabaja, Soerabaja, alt.: 10 m: *Dorgelo* 206 (flow. on 15-IV-1922) and 1606 (flow. on 7-III-1923); hill behind Koepang, alt.: 25 m: *Dorgelo* 367 (flow. on 13-V-1922) and 401 (fr. on 13-V-1922).

A species new for Java. I am not quite certain of the correctness of the name. On identifying it with the key given by Burret the species appears to belong to the group comprising *G. helicterifolia* Wall., *G. polygama* Roxb. and *G. retusifolia* Kurz. On account of insufficient material, the absence of type specimens and insufficient original descriptions it was not possible to state the name with certainty. Neither could Burret attain a decisive conclusion. It is not altogether impossible that our specimens belong to a new species. The name *retusifolia* was provisorily chosen, since, according to Burret, also Merrill seems to have been able to examine material under this name from Java. However, our specimens do not agree in all respects with the original description by Kurz (cf. Burret l.c.).

Grewia acuminata Juss. in Ann. Mus. Par. IV, 91 (1804); N. Fl. IVb, fam. CV, 20; Sch.fl. 151 — *Grewia scabrada* Wall., Cat. nr. 1113 (1828) — *Grewia odorata* Bl., Cat. Btz. 79 (1823).

The identity of these three species has already been mentioned in the Kew Index. As to *G. odorata*, Burret hesitates whether or not to include it. I found the type specimen of *G. odorata* Bl. to agree in all respects with specimens identified as *G. acuminata*. Of the last-named species and *G. scabrada* Wall. the type specimens were not available to me but the study of the specimens, cited by Burret, the literature and the other specimens extant convinced me of the correctness of the identification, since the smooth and glabrous leaves of *acuminata* are connected by many intermediate forms with the coarse and hairy leaves of *scabrada*.

Grewia laevigata Vahl, Symb. Bot. I, 34 (1790); N. Fl. IVb, fam. CV, 21; Sch.fl. 150 — *Grewia guazumifolia* Juss. in Ann. Mus. Par. IV, 89, t. 48, f. 3 (1804) — *Grewia multiflora* Juss., l.c. t. 47 — *Grewia oblongifolia* Bl., Bijdr. 114 (1825) — *Grewia glabra* Bl., l.c. 115.

The remarks made under *Grewia Microcos* L. are also applicable to these species, some of which are kept separate by Burret (Notizbl. Bot. Gart. Berl. IX, 592—880, 1926) whereas he considered *G. guazumifolia* Juss. and *G. oblongifolia* Bl. conspecific. He distinguishes *G. glabra* Bl.

on account of the indumentum of the leaves. I examined the type specimens of both *G. oblongifolia* and *glabra* and arrived at the conclusion that this character does not procure a sufficient base for a specific discrimination, since the indumentum is very variable in all respects.

The differences between the former three and *G. multiflora* Juss. are supposed to include the relative length of petiole and peduncle, but Burret himself makes such restrictions for the various species as to render these differences fictitious. According to my own investigations, the indumentum does not provide us with sufficient distinguishing characters either. However, it must be stated that the type specimen of *G. multiflora* Juss. could not be examined by me.

The most important difference is that which Burret makes between the former four species and *G. laevigata* Vahl. Most authors have considered this group of four and *laevigata* identical but, according to Burret, this is not correct. He places them in two different groups: *laevigata* in the *Oppositiflorae*, the other four in the *Didymae*, discriminating these groups as follows (l.c. 634):

| | |
|--|------------------------|
| Androgynophorum supra nodum atque infra staminum insertionem fere semper productum, duplex, parte inferiore glabra atque superiore saepe quam illa longiore ± pilosa. Petalorum unguis supra laminae basin squamoso-protractus, lamina conspicue infra illius apicem inserta | <i>Oppositiflorae.</i> |
| Androgynophorum simplex, supra nodum haud productum. Petalorum lamina ex apice unguis exiens | <i>Didymae.</i> |

The results of my own investigation are 1. that the androgynophore and the petals of the type specimens of *G. glabra* Bl. and of *G. oblongifolia* Bl. exactly correspond to the description given by Burret for the *Oppositiflorae*; 2. that, although I did not examine the type specimen of *G. laevigata* Vahl, I could consult one of the numbers of *G. bracteata* Roth cited by Burret; this species also belongs to the *Oppositiflorae* and its gynandrophore perfectly agrees with that of *G. glabra* and *oblongifolia*; 3. that in the Javanese species the gynandrophore can always be considered consisting of two parts, though the hairy upper part may be very short. These considerations led me to consider all the species mentioned above as forms of *G. laevigata* Vahl.

Grewia eriocarpa Juss. in Ann. Mus. Par. IV, 93 (1804); N. Fl. IVb, fam. CV, 20; Sch.fl. 151 — *Grewia celtidifolia* Juss., l.c.; Sch.fl. 151 — *Grewia Koordersiana* Burret in Notizbl. Bot. Gart. Berl. IX, 662 (1926) — *Grewia excelsa* Koord. et Val. (nec Vahl), Bijdr. Booms. Java V, 411 (1894); Koord., Exkurs. Fl. Java II, 575 (1912); Koord. et Val., Atl. Baumart. Java II (1914) f. 395 (excl. auct. cit. atque synon.).

The distinction of these four species was based upon the indumentum, especially of the leaves. On account of a series of transition-forms their specific distinction had to be dropped. As to the nomenclature the following remarks may be made:

Koorders identified his specimen — later on called *Koordersiana* Burret — with *G. excelsa* Vahl and many other authors likewise applied this name to specimens which, by still other investigators, were attributed to *G. eriocarpa*, *celtidifolia* or *Koordersiana*. Burret keeps *excelsa* Vahl and *Koordersiana* apart and it is therefore the more surprising that in his paper no discussion of the former species is found beside the remark that

its proper name should be *G. arborea* (Forsk.) Lamk. Even under *G. Koordersiana* it is not mentioned by which characters this species differs from *G. excelsa* Vahl. As I could not consult the type specimen of the last-named species and the literature concerned does not lead towards any conclusion I am unable to decide whether *G. excelsa* Vahl, although mentioned to occur in Asia, is identical with any of the species quoted. Provisionally, the Java specimens have therefore been kept apart under the name of *G. eriocarpa* Juss.

GONYSTYLACEAE, N. Fl. IVb, fam. CVI.

(by A. D. J. Meeuse)

Gonystylus bancanus (Miq.) Baill., Hist. Pl. VI, 123 (1877); N. Fl. IVb, fam. CVI, 1 — *Aquilaria bancana* Miq., Fl. Ind. Bat. Suppl. 355 (1860) — *Gonystylus Miquelianus* T. et B. in Bot. Zeit. XX, 265 (1862).

STERCULIACEAE, N. Fl. IVb, fam. CVII.

(by A. G. L. Adelbert)

Melhania javanica Adelb., nov. spec.; N. Fl. IVb, fam. CVII, 5 — *Suffrutex erectus*, saepe ramosissimus, 0.5—1.5 m altus. *Caulis* brunneus vel badius teres glaber, ramulis densis dilute luteo-viridibus minute stellato-pubescentibus-tomentosis. *Folia* alterna simplicia subcoriacea ovata vel ovato-oblonga, basi rotundata vel subcoarctata, apicem versus sensim angustata vel subacuminata acuta, crenato-denticulatis, supra basin quinque nerviam utrinque praedita nervis lateralibus 4—6 subtus prominentibus supra vix sulcatis, marginem versus haud conjunctis, in denticulos terminantibus, supra modice. subtus dense pubescentia, 25—75 mm longa, 12.5—55 mm lata (basi); stipulae filiformes caducae 5—7.5 mm longae, cum petiolis subteretibus 10—27.5 mm longis dense pubescentes. *Inflorescentiae* conferte racemosae, pedunculatae, axillares, 2—5-florae, dense pubescentes, pedunculo 5—40 mm longo. *Flores* pentameri, bracteolis calycis basi adpressis 3 lanceolatis supra medium latioribus acutis vel acute acuminatis, utrinque pubescentibus, pedicellis teretibus, 2.5—10 mm longis. *Sepala* libera lanceolata longe acute acuminata, extus pubescentia, intus praeter apicem glabra, 10—12.5 mm longa. *Petala* in toro plano longe persistentia verum-tamen ante fructuum maturitatem decidua, late obovata laete lutea, glabra 5—10 mm longa. *Tubus stamineus* brevis membranaceus, stamina 5, staminodia 5 taeniiformia vel spatulata, 5—7.5 mm longa, filamentis c. 5 mm longis, antheris longe sagittatis. *Ovarium* sessile 5-loculare dense pubescens, loculis pauci-ovulatis, stylo 5-fido, stigmatibus introrsis. *Capsula* loculicide 5-valvata pubescens globosa vel ovoidea calyce brevior 5—10 mm longa, loculis pauci-seminatis, seminibus c. 2.5 mm longis.

JAVA, E. Java, Besoeki, Asem Bagoes, about 20 m alt.: Backer 8145 (flow. and fr. on 27-V-1913): type specimen in Herb. Lugd. Bat. (distributed as *Melhania incana* Heyne).

In his "Onkruidflora", p. 448, this species was quoted by Backer as *Melhania incana* Heyne (in Wall. Cat. nr. 1200). It differs, however, from that species mainly in the leaves which in *M. incana* are narrowly ovate-

oblong or ovate-lanceolate, tapering gradually from the rounded base to the broadly rounded apex, almost entire, and 8—12 mm broad at base (cf. Hooker, Fl. Brit. Ind. I, 372, 1875 and Bentham, Fl. Austral. I, 234, 1863).

Melhania javanica is locally abundant in grassy wilds and thickets on sandy soil, at an altitude of 5—20 m in the driest part of the very north-eastern part of Java.

Sterculia rubiginosa Vent., Jard. Malm. sub t. 91 (1804); N. Fl. IVb, fam. CVII, 21 — *Sterculia Stapfiana* K. Schum. in Engl. Jahrb. XXIV, Beibl. LVIII, 19 (1897).

Sterculia cordata Bl., Bijdr. 83 (1825); N. Fl. IVb, fam. CVII, 21 — *Sterculia javanica* R. Br. in Benn., Pl. Jav. Rar. 230 (1844); Sch.fl. 138.

Sterculia coccinea Jack (non Roxb.) in Malay Misc. I, I, 20 (1820); N. Fl. IVb, fam. CVII, 22 — *Sterculia laevis* Wall., Cat. nr. 1138 (1828); Wall. apud Jack in Hook., Bot. Misc. III, 287 (1830); Sch.fl. 137 — *Clompanus coccinea* (Jack) O.K., Rev. Gen. Pl. I, 77 (1891).

Sterculia Treubii Hochr. in Bull. Inst. Buitenz. XIX, 20 (1904); Pl. Bogor. Exsicc. 4 (1904); N. Fl. IVb, fam. CVII, 23; Sch.fl. 137 — *Sterculia nesogenes* Hochr. in Candollea II, 430 (1925).

Sterculia Hamiltonii (O.K.) Adelb., comb. nov.; N. Fl. IVb, fam. CVII, 23 — *Clompanus Hamiltonii* O.K., Rev. Gen. Pl. I, 77 (1891) — *Sterculia coccinea* Roxb. (non Jack), Hort. Beng. 50 (1814); Fl. Ind. III, 151 (1832); Sch.fl. 137 — *Sterculia lanceolata* Ham. (non Cav.) in Wall., Cat. nr. 1122 (1828).

Sterculia monosperma Vent., Jard. Malm. (1804) t. 91; N. Fl. IVb, fam. CVII, 23 — *Sterculia nobilis* R. Br. (non Sm.) in Benn., Pl. Jav. Rar. 231 (1844).

Sterculia longituba Adelb., nov. spec.; N. Fl. IVb, fam. CVII, 25 — *Arbor?* Innovationes glabrae fuscae, cortice valde rugoso, multis lenticellis ovalibus albis, cicatricibusque foliorum delapsorum praeditae. *Folia* ad ramulorum apices conferta alterna simplicia glabra integra coriacea 90—300 mm longa, 35—130 mm lata, obovato-oblonga, basi angustata subacuta, obtusa, rotundata vel subcordata, apice brevissime acuminata, nervis lateralibus utrinque 9—12, utroque latere prominentibus arcuatim conjunctis, stipulis caducis, petiolo glabro basi apiceque incrassato laevi 7.5—40 mm longo. *Inflorescentiae* andromonoicae paniculatae pedunculatae pendentes satis ramosae multiflorae, glabrae vel subglabrae, ex axillis foliorum vel eorum cicatricibus ortae, 15—30 cm longae, bracteolis lanceolato-linearibus acutis parce pubescentibus 5—6 mm longis caducis. Pedicelli leviter pubescentes articulari gracillimi 6—17 mm longi. *Calyx* extus rubro-viridis glaber, tubo subanguste campanulato, basi saepe abrupte contracto, intus rubidus, pilis glanduliferis sacchariferis vestitus, sepala e basi lata lineari-subulata marginibus revolutis tubo subaequilonga erecto-potentia, basi rubro-viridia, apices versus flavo-virescentia, 7—10 mm longa, intus pilis stellatis parvis cum pilis longis setaceis intermixtis instructa. *Corolla* deest. ♂: gynandrophorus 2 mm longus parce pubescens, apice 10—11 antheris sessilibus fasciculatis praeditus, thecis 2 parallelis pistilli rudimenta includentibus. Herm.: gynandrophorus 0.7 mm altus, apice sub ovariorum basibus 10—11 antheras irregulariter verticillatas sessiles gerens, ceterum ut in ♂. *Ovaria* et styli 5 connexi dense stellato-pubescentes, stylis clavatis recurvatis. *Folliculi* 1—5 liberi basi an-

gustata sessiles oblongi, rostello curvato coronati velutini laete rubri, intus longe albo-pubescentes, c. 90 mm longi; *semina* in fructu unico dissecto 7.

Java: *Cultivated* in the *Buitenzorg Botanical Garden* under *nr. IV. I. 169*; said to originate from Java (exact locality unknown): type specimen in Herb. Lugd. Bat.

EUPHORBIACEAE, N. Fl. IVc, fam. CXII.

(by A. G. L. Adelbert and A. D. J. Meeuse)

Antidesma montanum Bl., Bijdr. 1124 (1826); N. Fl. IVc, fam. CXII, 36 — *Antidesma Teysmannianum* Pax et K. Hoffm. in Engl. Pflanzenr., Euphorb.-Phyllanthoid.-Phyllanth. 144 (1922).

Glochidion glomerulatum (Miq.) Boerl., Handl. Fl. Ned. Indië III, 276 (1900); N. Fl. IVc, fam. CXII, 45 — *Glochidion palustre* Koord. in Bull. Jard. Bot. Buitenz., Sér. III, I, 145 (1919).

Phyllanthus trichosporus Adelb., nov. spec., N. Fl. IVc, fam. CXII, 59 — *Fruticulus erectus*, ± 1 m altus. Caulis aequaliter ramosus ramulique valde rubro-suffusi apice angulato-complanati glabri. *Folia* in caule primario rudimentaria anguste triangulari-linearia acuta 0.5—1 mm longa; stipulis appertinentibus elongate triangularibus acutis vel acute acuminatis 2—2.5 mm longis; folia ramulorum lateralium alternatim bifaria oblique ovato-ovalia, obovato-ovalia vel obovato-oblonga, basi \pm acuta, apice acuta vel plerumque brevissime acute acuminata mucronata glabra integerrima herbacea, costa subtus subprominente, nervis lateralibus utrinque 5—9 satis longe a margine arcuatim anastomosantibus; folia (subtus praesertim) satis distincte venulosa 10—25 mm longa, 5—9 mm lata; petiolis 1—1.25 mm longis. *Flores* σ in axillis inferioribus subracemulosi; racemulis subsessilibus 1—4-floris; pedicellis filiformibus summo apice incrassatis glabris 2—3 mm longis; *tepala* 4 late ovalia, apice rotundata vel obtusissima tenuiter membranacea integerrima glabra, ± 2 mm longa et lata; glandulae disci connatae in angulum crassum subcrenulatum, basin gynandrophori cingentem; gynandrophorus conicus truncatus in medio apice pistillodium columnare tenue antheras paullo superans gerens, ad marginem antheris 2 oppositis sessilibus horizontalibus praeditus; antherae biloculares loculis inferne divergentibus decussatis. *Flores* φ solitarii in axillis superioribus, pedicellis suberassiusecule filiformibus sub anthesi 2—3 mm longis, postea accrescentibus, sub fructu maturo ± 5 mm; *tepala* 6, infra discum producta et inter sese connata in conum inversum pedicelli apicem cingentem 1.5—2 mm longum, supra conum ovali-suboblonga acuta membranacea integerrima intus prope basin subcarinata, sub anthesi 3—3.5 mm longa, ± 2 mm lata, postea valde accrescentia sub fructu maturo 6—6.5 mm longa, ± 3 mm lata; discus annularis vel subcupularis 6-lobus margine undulatus; *ovarium* depresso globosum sulcis longitudinalibus 3 subprofundis et 3 cum eis alternantibus subinconspicuis perecursum, laeve glabrum; ovula collateralia; stylis 3 basi brevissime connatis late divergentibus denique horizontaliter patentes ± 1 mm longis, \pm usque ad medium partitis in ramos 2 filiformes obtusos apice incurvos recurvosve; *capsula* depresso globosa leviter triloba apice impressa glabra laevis ± 3 mm alta, 4—4.5 mm lata, trilocularis; pericarpio ab endocarpio solubili; endocarpium in cocca 3 bivalvia bisperma dissiliens, columna centrali persistente; semina dorso convexo lateribus

planis, \pm 2 mm longa, pilosa; pilis in sicco arcte adpressa, madefactis patentissimis, tenuissimis pallidis usque ad 0.5 mm longis.

Celebes, S.E. Celebes, Roembia, Liano, on dry grounds, in brushwood on weathered phyllites, alt. 25—250 m: *C. A. Backer 2774* (fr. on 12-IX-1909): type specimen in Herb. Lugd. Bat.

Java, Soerakarta, Goenoeng Kidoel between Djepitoe and Kalak, on dry grounds along wayside, alt. 200 m: *C. A. Backer 2774* (fr. on 12-IV-1912).

This plant, which by its pilose seeds differs from all other species of the genus known to me, belongs to the section *Eriococcus* (Hassk.) M. A. It resembles *P. Rheedii* Wight which differs, however, by the linear disk-lobes in the ♀ flower and by the glabrous seeds.

Sauropus spectabilis Miq., Fl. Ind. Bat. Suppl. 446 (1860); N. Fl. IVc, fam. CXII, 63 — *Sauropus Wichurae* M. A. ex Pax et K. Hoffm. in Engl. Pflanzenz., Euphorb.-Phyllanthoid.-Phyllanth. 220 (1922).

Ostodes pendula (Hassk.) A. Meeuse, nov. comb.; N. Fl. IVc, fam. CXII, 109 — *Croton pendulum* Hassk., Pl. Jav. Rar. 266 (1848) — *Paracroton pendulum* (Hassk.) Miq., Fl. Ind. Bat. I, II, 382 (1859) — *Ostodes macrophylla* (M. A.) Bth. et Hook.f., Gen. III, 299 (1883), (sub *Trigonostemon macrophylla* M. A.).

CAESALPINIACEAE, N. Fl. Va, fam. CXVIII.

(by C. A. Backer)

Maniltoa browneoides Harms, Notizbl. Bot. Gart. Berlin, III, 190 (1902); N. Fl. Va, fam. CXVIII, 7 — *Maniltoa gemmipara* Scheff. ex Backer, Sch.fl. 424.

This species has been cultivated for many years in the Botanic Gardens at Buitenzorg under the name of *M. gemmipara* Scheff. It has been imported as an ornamental tree in Javanese gardens and the name was published without a valid description in the Schoolflora (1911). The species had, however, already been validly described by Harms in 1902 as *M. browneoides*.

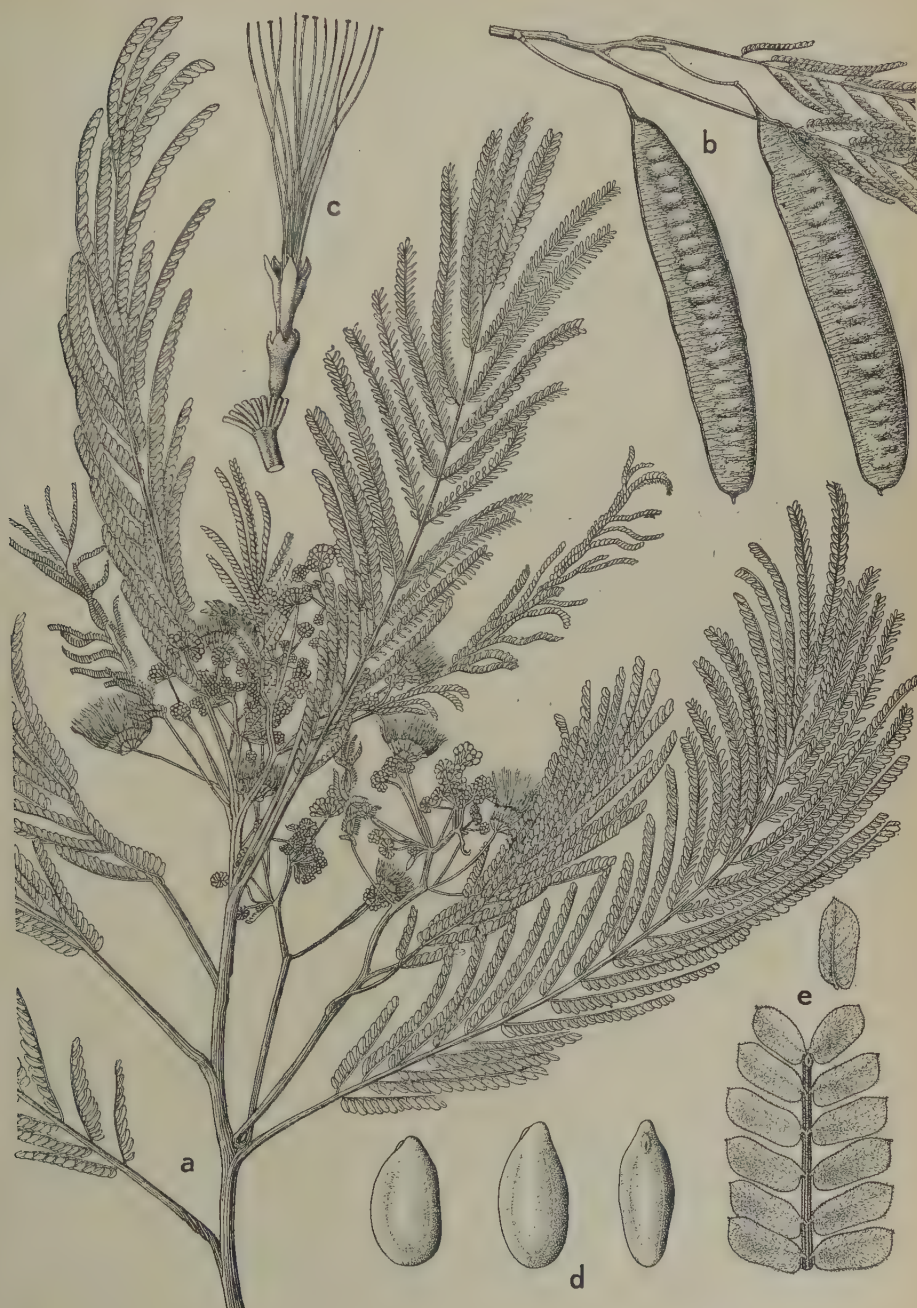
It is quite unbelievable that this plant, as is mentioned on the label of the type specimen, should have been collected by Forbes in S.E. Java. In the Herb. Lugd. Bat. many plants are preserved which bear the same indication on their labels. The origin of this mistake is as yet unknown. Forbes has probably never visited S.E. Java as may be inferred from the map in his "A Naturalist's Wanderings".

Sindora javanica (Koord. et Val.) Backer, nov. comb., N. Fl. Va, fam. CXVIII, 8 — *Sindora sumatrana* Miq., var. *javanica* Koord. et Val., Bijdr. Booms. Java, II, 45 (1845); Sch.fl. 423.

The type of *Sindora sumatrana* Miq. differs by glabrous leaves, orbicular to broadly ovate, much smaller (30—50 mm long, 30—35 mm broad) and indehiscent pods with 2—3 mm long spines, much smaller funicles (3—4 mm broad, much narrower than the seed) and smaller, more oblong and thicker seeds (10—13 mm long, 8—9 mm broad).

The statement by Koord. & Val. (Bijdr. Booms. Java, II, 46) that the pods and seeds of *S. javanica* are similar to those of *S. sumatrana* has its source in the fact that pods of *S. sumatrana*, bought on a Javanese market, occur in the material of *S. javanica* in Herb. Koorders. These

To be inserted in Blumea Vol. V, No. 3, 1945, to face p. 509.



Albizia sumatrana Steen. a. Flowering twig 0.6 \times ; b. Fruiting twig 0.6 \times ; c. Flower 3.6 \times ; d. seeds, left and central different size, right ventral view, 4.8 \times ; e. end of pinna with gland, seen from above and one leaflet lower surface, 2.4 \times . Drawn after living material from the cultivated plant anno 1932.

Pods are regularly kept for sale on the pasars (markets) in Java and from this the authors incorrectly inferred that they were hailing from Java. In fact, the *Sindora*-pods, occurring in the Javanese medicine trade, are imported from Palembang (Sumatra).

Bauhinia leptopus Perk., forma **javanica** Backer, nov. form., N. Fl. Va, fam. CXVIII, 20 — *Frutex* scandens. *Folia* ovato vel ovato-oblonga, 60—125 mm longa, 40—80 mm lata, basi subcordata vel truncata, apice breviter acuminata leviter emarginata vel subintegra, glabra, supra nitida intense viridia, subtus novella minute adpresse fusco-pubescentia glabrescentia. *Inflorescentiae* saepe in ramulis pumilis positae dense brunneo-pubescentes, magnam paniculam foliosam efformantes. *Flores* perfragrantes, pedicellis 15—40 mm longis. *Calyx* dense breviterque brunneo-pubescent, tubo 7—13 mm alto, limbo 6—8 mm longo 3—4-valvato. *Petala* primo luteo-alba, deinde rubra, fusco-pubescentia, ungue 4—5 mm longo, lamina 11—21 mm longa et lata, petalo postico minore. *Stamina* 3, staminodia 7—10, plerumque 8. *Stigma* latum. *Legumen* (nondum maturum) 80—120 mm longum, 30—45 mm latum; semina 4 vel pauciora.

Java, W. Java, Tjitjoeroeg (nowadays Djampang Koelon), S.W. corner of the Preanger, alt. 300—750 m: Backer 17253 (18-XI-1914): type specimen; Lengkong, Preanger: Backer 17016, 17043 (13 and 14-XI-1914).

Differs from the type (Philippines) by the much shorter pedicels (in type 70—80 mm), from the closely related *B. Kockiana* Korth. from Sumatra and Borneo by the much shorter calyx tube (in *B. Kockiana* 16—30 mm) and by the leaves which, in *B. Kockiana* are cuneate to obtuse or rounded at base.

Cassia javanica L., var. **acutifolia** Van Steen., nov. var., N. Fl. Va, fam. CXVIII, 29 — *Foliola* 14—20, eis *C. nodosae* Buch.-Ham. similia, oblonga vel acutiuscula, supra valde nitida, subtus opaca, 40—70 mm longa, 22.5—32.5 mm lata. *Pedicelli* 35—45 mm longi. *Flores* ut in typo, semper ante fructificationem decidui.

Java, W. Java, Krawang, Michiel-Arnolds-Estate, near Lemah Abang, in forest skirt, about 25 m alt.: nr. ?

In the above-mentioned locality three specimens were collected which differ from the genuine *C. javanica* L. However, a further examination is required to state whether the newly described variety possibly represents a hybrid between the last-named species and *C. nodosa* Buch.-Ham.

Mezoneurum sumatranum Wight et Arn., Prod. 283 (1834); N. Fl. Va, fam. CXVIII, 48 — *Mezoneurum Koordersii* Backer ex Koord.-Schum., Syst. Verz. I, Fam. 128, 36 (1911); Sch.fl. 396 — *Mezoneurum sulfureum* Miq., Fl. Ind. Bat. I, I, 105 (1860); Sch.fl. 397.

The type specimen of the last-named synonym (Herb. Utr.), consisting of several detached leaves and two detached flowers, has been incorrectly described as possessing 14 pairs of leaflets. The correct number is 4—7 pairs.

MIMOSACEAE, N. Fl. Va, fam. CXIX.

(by C. A. Backer)

Albizzia sumatrana Van Steenis, nov. spec., N. Fl. Va, fam. CXIX, 12 — *Arbor* inermis celeriter crescens 20—25 m alta. *Rami* glabri griseo-

brunnei, multis lenticellis pallidis c. 5-fariis, lineis plus minusve tortuosis, muniti, petiolorum cicatricibus satis magnis transversis in 3 carinas (laterales crassiores) decurrentibus, axilla 2 cicatricibus superpositis, basali gemmae haud excretae, apicali inflorescentiae delapsae praedita. Ramulorum apices cum petiolis rhachidibusque dense minuteque ferrugineo-pubescentes. *Folia* novella aureo-brunnea. Petioli 20—40 mm longi cum rhachide supra sulcati, subtus cum rhachidis parte basali conspicue 3-costati, rhachidis parte apicali tereti, petiolo 50—170 mm longo, apice glandula scutelliformi circulari 2 mm diametrente rubro-marginata (intus 1 mm diam. viridi) munito. Pinnae oppositae utrinque 8—13, supra articulationem 2 mm longam sessiles, 2 pinnarum apicalium articulationes plerumque binis stipellis saepe caducis uno latere breviter subulatis, uno praeterea glandulosis munitae. Pinnarum rhachides 45—75 mm longae, supra intense, subtus pallide virides, teretes minute albo-pubescentes. Foliola pro pinna utrinque 15—25 opposita, supra viridia minutissime pubescentia, subtus glauca, costa media a margine antico 0.75—1 mm distante, praecipue basi dense pubescentia, apice obtusa vel rotundata mucronulata, basi antice angustata, postice dilatata, inter venas subtus sparse minute pubescentia. *Inflorescentiae* paniculatae foliatae rotundiusculae subtruncatae c. 150 mm longae e capitulis compositae. Capitula \pm 6 in axillis foliorum posita 15—20-flora, capitulorum flore medio majore, pedunculis 20—40 mm longis, pedicellis 1—3 mm longis, calyceibus corollisque luteo-viridibus dense minute aureo-brunneo-pubescentibus. *Calyx* tubulosus apice paulo dilatatus 2.5—3.3 mm altus margine 5-dentatus, dentibus acute triangularibus c. 0.5 mm longis erectis vel paulo conniventibus. *Corollae* c. 6 mm longae tubus 2—3 mm e calyce exsertus tubulosus, apice paulo dilatatus, lobis quam tubus brevioribus acute triangulari-oblongis c. 15 mm longis, apice brevissime albo-penicillatis. *Stamina* 19—25 alba, 10—11 mm e corolla exserta, erecta vel paulo divergentia, tubus stamineus in corollae tubo inclusus, antheris minimis sulfureis 0.2 mm longis, 0.25 mm latis, connectivo minutissime mucronulato, thecae bis longae quam latae. *Ovarium* gynophoro 1 mm longo suffultum, viride, 2 mm longum, suturis nonnullis pilis adpressis ferrugineis praeditis, stylo c. 14 mm longo albo, stigmate punctiformi. *Legumen* basi in carpo-phorum 6—8 mm longum angustatum, apice truncatum mucrone 1—2 mm longo stylari coronatum, 8—10 cm longum 15 mm latum, flavum, tenue obscure ferrugineum, cum indumento ferrugineo, 17—23-spermum, suturis incrassatis; semina nondum vidi.

Java, Buitenzorg, Tea Experiment Station, alt.: \pm 250 m: *Prillwitz s.n.* (flow. on 9-VI-1933): type specimen in Herb. Lugd. Bat., duplicate in Herb. Hort. Bog.

This species was originally discovered during the process of deforestation on behalf of the Plantation "Boekit Gompong" in Sumatra's West Coast, alt. about 1150 m. From there it was in 1927, through the Tea Experiment Station at Buitenzorg, distributed throughout Java as a shadowing and a green manuring tree (cf. Prillwitz, *Albizzia sumatrana* als schaduwboom in theetuin, Archief Theekult. N. I. no. 3, 1931, 129—134, 4 figs; and Encycl. N. I. VI, Suppl. II, 1932, 864). The description was kindly put at our disposal by Dr C. G. G. J. van Steenis of the Buitenzorg Herbarium.

In young specimens the crown is hanging over, in adult ones it is erect.

PAPILIONACEAE, N. Fl. Va et b, fam. CXX.

(by C. A. Backer)

Sophora Wightii Baker in Hook. f., Fl. Brit. Ind. II, 250 (1879); N. Fl. Va, fam. CXX, 26 — *Millettia Koordersii* Backer ex Koord.-Schum., Syst. Verz. I, Fam. 128, 43 (1911); Sch.fl. 326.

Crotalaria triquetra Dalz., var. **tetragona** (Miq.) Backer, nov. var., Sch.fl. 311; N. Fl. Va, fam. CXX, 35 — *Crotalaria tetragona* Miq., Fl. Ind. Bat. I, I, 335 (1855) non Roxb.

Millettia rufa Backer, nov. spec., N. Fl. Vb, fam. CXX, 62 — *Frutex* scandens. *Rami* dense brunneo-pubescentes. *Stipulae* oblique ovato-falcatae acutae, longe pilosae, c. 7.5 mm longae. *Folii* rhachis dense brunneo-pubescentes, petiolo 70—110 mm longo computato 140—200 mm longa, estipellata; foliola 7—9 subcoriacea, petiolulis 7.5—12.5 mm longis, oblongo-lanceolata vel obovato-lanceolata, basi acuta vel obtusa vel rotundata, apice acuminata, supra (nervis longe pilosis exceptis) glabra, subtus dense longiuscule obliquo-erecte pubescentia, 60—120 mm longa, 25—32.5 mm lata, costa media utrinque prominens, nervi laterales utrinque c. 8 oblique adscendentes, prope margines curvati, margines haud attingentes. *Inflorescentiae* paniculatae solitariae erectae axillares 200—300 mm longae remotae, rhachide densissime erecte longiuscule brunneo-pilosa, bracteis mox caducis ovato-oblongis acutis fornicatis, dorso dense longiuscule fusco-pilosis, 4.5—5 mm longis; inflorescentiae partiales in rhachidis verrucis fasciculatae, inferiores c. 8-florae, superiores pauciflorae, pedicelli dense fusco-pubescentes, c. 1.5 mm longi, bracteolis fugaces, calyci adpressis, oblongis obtusis fornicatis c. 2.5 mm longis, extus dense fusco-pubescentibus. *Calyx* late cupuliformis, extus densissime longe brunneo-pubescentis, intus glaber, c. 4 mm altus, dente inferiore triangulari, c. 0.2 mm longo; ceteris dentibus fere nullis. *Corolla* lilacina; vexillum (cum ungue 2—2.5 mm longo) c. 12 mm longum, 8—9 mm latum, lamina late ovalis, basi exauriculata in unguem cuneatim angustata, 2 tuberculis parvis carinatis in unguem decurrentibus ornata, apice late rotundato-truncata, extus secus margines dense adpresse fusco-pubescentis; alae carinaque subaequilongae, alae, ungue 4—4.5 mm longo computato c. 12 mm longae, lamina oblongo-linearis, apice rotundata vel obtusa leviter sursum curvata, basi margine superiore truncato vel breviter auriculata; carinae laminae falcatae obtusissimae, margine superiore profunde introrsum plicata, apice margine inferiore densiuscule breviter pubescente. *Stamen* vexillare liberum, ceteris filamentis connatis, tubo stamineo postice fisso; antherae ovoideae satis parvae, in staminibus brevioribus c. in medio, in longioribus paulo supra basin affixae. *Ovarium* sessile lineare densissime fusco-pubescentis, ovulis (in 2 floribus dissectis) 6, stylo basi anguste conoideo dense fusco-pubescente, alioquin glabro, sursum curvato. *Legumen* adhuc ignotum.

J a v a, C. Java, S. Kediri, bay of Popoh, near coast: *Dorgelo* 1770 (9 to 11-V-1923): type specimen in Herb. Lugd. Bat.

Sarcodum scandens Lour., Fl. Cochinch. 462 (1790); N. Fl. Vb, fam. CXX, 63 — *Clinanthus Binnendijckianus* Kurz in Journ. As. Soc. Beng. XL, 51 (1871).

Sesbania sericea (Willd.) Link, Enum. Hort. Berol. II, 244 (1822);

et ex Desv. in Mém. Soc. Linn. Par. IV, 300 (1826); N. Fl. Vb, fam. CXX, 66 — *Sesbania polyphylla* Miq., Fl. Ind. Bat. I, I, 288 (1855).

Sesbania javanica Miq., Fl. Ind. Bat. I, I, 288 (1855); N. Fl. Vb, fam. CXX, 66 — *Sesbania grandiflora* Miq. (non Pers.), Fl. Ind. Bat. I, I, 288 (1855) — *Sesbania Roxburghii* Merr. in Philipp. Journ. Sci. IV, 269 (1909) — *Sesbania paludosa* Prain in Journ. As. Soc. Beng. LXVI, 82 (1897); Sch.fl. 330.

Smithia ciliata Royle, Illustr. Bot. Himal. 201 t. 35, f. 2 (1839); N. Fl. Vb, fam. CXX, 71 — *Smithia coerulescens* Zoll. et Mor. in Nat. en Geneesk. Arch. Neerl. Ind. III, 76 (1846); Sch.fl. 334.

Uraria candida Backer, nov. spec. — *Suffrutex* erectus, parce ramosus haud longe vivens; radice paleari longa. *Caules* superne densissime vestiti pilis patentibus brevibus uncinatis (saepe additis pilis patentibus rectis longioribus brevioribusve), tarde glabrescentes; stipulae erectae, e basi lata acute acuminatae, 3—6 mm longae caducae. *Folia* pinnatim 3- vel 5-foliolata, inferiora saepe unifoliolata; rhachis (petiolo 20—120 mm longo computato) 25—180 mm longa, pilis patentibus brevibus uncinatis dense vestita; stipellae anguste lineari-subulatae 2—4 mm longae; petioluli 2—4 mm pilis patentibus uncinatis rectisque dense vestiti; foliola late ovata, ovata vel ovato-oblonga, basi subcoordata, late rotundata vel obtusissima, apice obtusa acutave, mucronata herbacea tenuiscula, supra glabra, infra glauca, reticulata, pilis patentibus brevissimis longioribusque (pro parte uncinatis) densiuscule vestita, in nervis majoribus et secus margines saepe pilis longis subappressis munita; foliolulum terminale vel unicum 3—15 cm longum, 12.5—100 mm latum; lateralialia 12.5—120 mm longa, 5—55 mm lata. *Racemi* terminales solitarii, interdum praeterea prope apices caulis ramorumque solitarii in axillis foliorum evolutorum suppressorumve (hoc in casu 2—5 valde approximati), paniculam haud efformantes, sessiles subsessilesve, erecti, 80—200 mm longi. *Inflorescentiae* rhachis densissime vestita pilis patentibus uncinatis brevibus, praeterea munita pilis multis rectis tenuibus longioribus brevioribusve. *Bractaeae* infimae longe persistentes, vacuae late ovatae acute acuminatae, 10—12 mm longae, 5—6 mm latae, superiores angustiores gradatim breviores, flores binos suffulcientes, deciduae; supremae 6—8 mm longae, 2 mm latae; bracteae omnes longe ciliatae, in dorso pilis adpressis longis munitae; flores supremi saepe abortivi. *Pedicelli* ante florum expansionem oblique patentes postea subhorizontaliter divergentes, prope apicem incurvati (ex eo uncinati), teretes, ima basi pilis longis patentibus muniti, ceteroquin tota longitudine pilis uncinatis brevibus patentibus dense vestiti, 6—8 mm longi. *Calyx* albus, pilis patentibus minutis dense vestitus; segmenta praeterea (praecipue secus marginem) dense vestita pilis patentibus tenuibus rectis, \pm 1.5 mm longis; tubus 1.75—2 mm longus; segmenta e basi breviter triangulari subulata; 2 superiora 2—2.5 mm longa, pro dimidia fere parte connata, reliqua 3.5—4.5 mm longa. *Corolla* candida; vexillum breviter unguiculatum obovatum levissime emarginatum supra basin maculis duabus parvis virido-flavis parum conspicuis notatum, 8.5—11 mm longum; alae breviter unguiculatae oblongo falcatae obtusa; carina alas subaequans; unguiculi 3.5—4 mm longi; laminae oblique obovato-semicirculares obtusissimae. *Stamina* 10 c. 7 mm longa glabra, uno libero novem filamentis connatis; antherae ignotae. *Ovarium* longe pilosum; stylus

longus in dimidia parte superiore conspicue incrassatus glaber; pars inferior longe pilosa. *Legumen* breviter stipitatum, e calyce longe exsertum, nigro-brunneum vel brunneum, dense hirtellum; articulis 3—5, plicato-retrofractis, elliptico-ovalibus, 4—5 mm longis, 3.25—3.5 mm latis.

Kangean-Archipelago, Isl. of Bangko, in grassy wilds and thickets; Backer 29188 (29-IV-1919): type specimen; Isl. of Saëboes, grassy wilds: Backer 29136 (28-IV-1919); Isl. of Paliat, teakforest: Backer 29408 (2-V-1919) and 29589 (6-V-1919), all in Herb. Hort. Bog.

Endemic

Derris caudata Backer, nov. spec., N. Fl. Vb, fam. CXX, 104 — *Frutex* volubilis, 2—4 m longus. *Rami* cortice laete brunneo tecti, lenticellis permultis rotundis pallide brunneis verruciformibus muniti. *Foliorum* rhachis, petiolo 60—100 mm longo computato, 120—220 mm longa, petiolulorum insertionibus exceptis glabra, estipellata; petioluli 5—8 mm longi; foliola 7 vel 9 oblonga vel ovato-oblonga, basi rotundata, apice obtuse caudato-acuminata, glabra, 75—150 mm longa, 35—80 mm lata, nervi laterales utrinque 6—10 arcuatim adscendentes tenues tamen conspicui. *Inflorescentiae* paniculatae, saepe in foliorum axillis delapsorum subinnovationibus solitariae sed plerumque 2—9 confertae, brevipedunculatae, cum pedunculo 70—150 mm longae, glabrae; inflorescentiae partiales triflorae pedunculo 7—9 mm longo, ex axilla bractee ovato-triangularis fornicatae 1.25—1.5 mm longae persistentis orto stipitato, pedicelli 9—10 mm longi ex axillis bractearum similium sed minorum orti, prope apicem articulati et bibracteolati; bracteolis per anthesin persistentibus late ovatis, apice obtuso vel rotundato fimbriatis, 1.25—1.5 mm longis. *Calyx* rubidus, 3—4 mm altus late campanulatus, extus glaber, intus (margine dense adpresse minute pubescente excepto) glaber, dentibus superioribus minimis vel nullis, medianis latis obtusissimis, inferiore triangulari 1—1.5 mm longo. *Corollae* vexillum glabrum recurvum, unguiculus c. 2 mm longus, lamina ovata apice late rotundata emarginata, basi interdum minute biauriculata, haud tuberculata, rubro-purpurea basi viridis, c. 12 mm longa, 9 mm lata; alae carinae aequilongae, unguiculis c. 5 mm longa computatis, 12—13 mm longi; alarum laminae basi satis firme carinae laminae basi adhaerentes, anguste oblongo-falcatae, apice rotundatae, basi margine superiore truncatae vel breviter obtuseque auriculatae; carina quam alae paulo latior, lamina oblongo-falcata, apice et basi margine superiore rotundata, secus marginem superiorem profunde introrsum plicato. *Stamen* vexillare supra basin liberam ceteris staminibus unitum. *Ovarium* breviter stipitatum lineare densissime adpresse pubescens; ovula 3 remota; stylus supra basin crassam pilosam glaber et sursum curvatus. *Legumen* adhuc ignotum.

Java, W. Java, Bantam, Menès, on riverbank, alt. 125 m: Backer 7061 (13-III-1913): type specimen in Herb. Hort. Bog.

Related to *Derris elliptica* Bth., *D. montana* Bth. and *D. danauensis* Backer (cf. note under next species).

Derris danauensis Backer, nov. spec., N. Fl. Vb, fam. CXX, 105 — *Frutex* scandens. *Rami* obscure brunnea, multis lenticellis oblongis verruciformibus pallidioribus praediti. *Folii* rhachis petiolo 60—120 mm longo computato 150—240 mm longa, sparse adpresse pubescens vel subglabra, petioluli 6—7 mm longi, foliola 9—11 oblonga, ovato-oblonga vel obovato-oblonga, basi rotundata vel subcordata obtusissima, apice obtuse acuminata,

solide coriacea, 70—160 mm longa, 30—60 mm lata, supra glabra, subtus sparse adpresse pubescentia, costa media utroque latere praecipue subtus prominens, nervi laterales utrinque 10—15 erecto-adscendentes, subtus prominentes. *Inflorescentiae* paniculam efformantes simplices vel basi 1—3 ramos longiuseculos emittentes, 50—150 mm longae, in ramis efoliosis in verrucis vel apice ramulorum brevium efoliosorum positae, rhachide densiuscule adpresse vel erecte brunneo-pilosae, inflorescentiae partiales triflorae patentes, pedunculi densiuscule plus minusve erecte longiusecule pilosi 4—12 mm longi, bracteis mox deciduis ovato-triangularibus 1.5—2 mm longis, pedicelli minute pubescentes 3—5 mm longi, bracteis eis pedunculorum similibus sed paulo minoribus, 1—1.5 mm longis, apice 2 bracteolis per anthesin persistentibus late ovato-rotundis pubescentibus 0.25—1.25 mm longis praediti. *Calyx* ante anthesin campanulatus, per anthesin cupuliformis, extus multis pilis longis adpressis brunneis ornatus, intus prope marginem densissime adpresse brunneo-pubescentem, ceterum glaber, 4—4.5 mm altus, dentibus superioribus fere nullis, lateralibus brevissime triangularibus, inferiore obtusissimo c. 0.75 mm longo. *Corollae* vexilli unguis 2.5—3 mm longus, lamina obovata, basi 2 auriculis perspicuis reflexis ornata, intus tuberculis et carinis carens, apice emarginata, dorso apicem versus pilis satis multis adpressis longis fuscis munita, 15—16 mm longa, c. 12 mm lata; alae carinaeque plus minusve aequilongae, c. 17.5 mm longae, unguiculis c. 7.5 mm longis, lamina oblonga, apice obtusa, basi oblique truncata; carinae unguis c. 7.5 mm longus, lamina falcata, basi apiceque rotundata. *Stamen* vexillare supra basin liberam, satis firme aliis filamentis adhaerens. *Ovarium* dense adpresse pubescens, c. 7.5 mm longum, 3-ovulatum, stylo supra basin incrassatam pilosam sensim sursum curvato et pro maxima parte glabro, 7.5—10 mm longo. *Legumen* adhuc ignotum.

Java, W. Java, Rawah Danau, on hoema's (fields), alt. \pm 120 m: *Van Steenis* 10539 (11-VIII-1937): type specimen in Herb. Hort. Bog.

Related to *Derris elliptica* Bth., *D. montana* Bth. and *D. caudata* Backer. The four species may be distinguished as follows:

1. Calyx glabrous, or pubescent on outside along upper margin only. Petals glabrous outside. Bracts on main inflorescencal axis persistent; all axes and pedicels glabrous. Leaflets 7—9, glabrous or with a few scattered hairs beneath. 2
Calyx on the whole outer surface more or less densely appressedly brown pubescent. Petals (especially the vexillum) at least at the tips appressedly brown pubescent outside. Bracts on main inflorescencal axis caducous; all axes and pedicels more or less densely pubescent. Leaflets in most leaves 9—13, minutely appressedly pubescent beneath. 3
2. Inside of vexillum above the claw provided with two auricles or crests, pale pinkish purple to almost white, with a green spot at the base. Racemes 1—5 together. Calyx green with a red hue, 5—6 mm high, along upper margin sparsely short-pubescent outside. Ovules 4—5. Leaflets moderately long acuminate. *Derris montana* Bth.
- Inside of vexillum above the claw without auricles or crests, pinkish purple with a green base. Racemes 1—9 together. Calyx dark purple, 3—4 mm high, glabrous outside. Ovules 3. Leaflets distinctly caudate. *Derris caudata* Backer
3. Lamina of vexillum almost entirely densely pubescent outside, ovate to broadly oval, 18—24 mm in diam. Ovules 4—5. Style hairy up to high above the base. Calyx 6—8 mm high. *Derris elliptica* Bth.
- Lamina of vexillum almost only at the top pubescent outside (much less densely than in the preceding species), obovate, 15—16 mm long, \pm 12 mm broad. Ovules 3. Style hairy at the base only. Calyx 4—5 mm high. *Derris danauensis* Backer

Mucuna Forbesii (Piper) Backer, nov. comb., N. Fl. Vb, fam. CXX, 128 — *Stizolobium Forbesii* Piper in Proc. Biol. Soc. Wash. XXX, 61 (1917) — *Mucuna diabolica* Backer ex K. Heyne, Nutt. Pl. Ned.-Ind. ed. 2, II, 824 (1927).

Mastersia Bakeri (Koord.) Backer, nov. comb., ex K. Heyne, Nutt. Pl. Ned.-Ind. ed. 2, II, 828 (1927); N. Fl. Vb, fam. CXX, 132 — *Mucuna Bakeri* Koord. in Med. 's Lands Plantentuin, XIX, 439, 460 (1898).

URTICACEAE, N. Fl. Part ?, fam. CXXX.

(by G. J. H. Amshoff)

Laportea terminalis Wight, Icon. t. 1972 (1853) — *Urtica evitata* Wall., Cat. n. 4588, nom. nud. — *Laportea evitata* Wedd. in DC., Prodr. 16, 1, 79 (1869); Smith in Koord. & Val., Booms. Java XII, 676 (1910); Koord., Exk. Fl. Java II, 127 (1912).

For the first time recorded from Java by Smith (1910) i.e., but apparently not rare and already collected by Blume [*L. decumana* (Roxb.) Wedd.].

Fleurya aestuans (L.) Gaud., Bot. Voy. Uranie, 497 (1826); Wedd. in Arch. Mus. Par. IX, 112 (1856) and in DC., Prodr. 16, 1, 74 (1869); Miq., Fl. Ind. Bat. I, II, 228 (1859); Koord., Exk. Fl. Java II, 128 (1912) — *Urtica cymosa* Hassk., Pl. Jav. Rar. 200 (1848) — *Fleurya cymosa* (Hassk.) Wedd. in Arch. Mus. Par. IX, 113 (1856) and in DC., Prodr. 16, 1, 73 (1869); Miq., Fl. Ind. Bat. I, II, 228 (1859); Koord., Exk. Fl. Java II, 128 (1912).

Weddell, who did not know Hasskarl's species, remarks: "A. Fl. aestuante praesertim stigmathe elongato differre videtur". Hasskarl's description (the type specimen itself was not available) is very clear and detailed, and he writes: "stigma crassum longum" while describing the flower (not the fruit, as is done by Weddell) and, regarding the dimensions of the flower, this is quite true, though the stigma is relatively very small in the enlarged fruit.

Fleurya ruderalis Gaud. is commonly recorded for Java, but has never been collected there, according to a letter from Dr C. A. Backer. The mistake can be traced down to Weddell in Arch. Mus. Par. IX, 11 (1856), where a specimen collected by Zollinger in Celebes is cited as: "In insula Java, Celebes, Zollinger 1797".

Pilea Wightii Wedd. in Ann. Sci. Nat. IV, 1, 186 (1854) and in DC., Prodr. 16, 1, 125 (1869); Hook., Fl. Brit. Ind. V, 554 (1888); Koord., Exk. Fl. Java II, 132 (1912).

According to Hooker i.e., also in Java, but this statement cannot be confirmed. Described from Br. India, also known from Sumatra, Atjeh (*Van Steenis 6557*) and S. Celebes, Bonthain Peak (*Bünnemeyer 11577, 11836, 11915*, all distributed as *Fleurya ruderalis* Gaud.).

Pilea subpuber Miq. (sphalmate subpubera) in Zoll., Syst. Verz. 105 (1854) and in Fl. Ind. Bat. I, II, 236 (1859) — *Achudemia javanica* Bl. in Mus. Lugd. Bat. 2, 57, t. 20 (1856); Wedd. in DC., Prodr. 16, 1, 163 (1869); Koord., Exk. Fl. Java II, 133 (1912) — *Pilea leucophlaea* Bl. in Mus. Lugd. Bat. 2, 53 (1856); Koord., Exk. Fl. Java II, 132 (1912).

It would be inconsistent to maintain the genus *Achudemia* Bl. while at the same time accepting the reduction of the allied genus *Pellionia* Gaud. to *Elatostema* Forst. (cf. Schröter and Winkler, Monographie der Gattung *Elatostema* s.l. in Fedde, Rep. Beih. 88, 1935—36). Weddell l.c. remarks about *Achudemia*: "Genus a *Pilea* distinctum floribus polygamis et perigonio fem. sicut masc. 5-partito nec tripartito". As to the first character, this is an exception, seen and figured by Blume only; as a rule, the flowers and inflorescences are unisexual. As to the second character, several *Pilea* species have since been described with a 4- or 5-merous female perianth (cf. Gagnepain in Lecomte, Fl. Indo China V, 2, 141, 1929) and Handel-Mazzetti, Symb. Sin. VII, 141, 1929). The second species described under *Achudemia*, *A. japonica* Max., has accordingly been transferred to *Pilea* by Handel-Mazzetti l.c. In the allied genus *Elatostema* Forst. s.l., the number of female perianth segments is not constant, even in the subgenera *Pellionia* and *Euelatostema* Schröter.

Pilea leucophlaea Bl. has been described after a ♂ specimen of *P. subpuber* Miq.

Boehmeria pilosiuscula (Bl.) Hassk., Cat. Hort. Bog. 79 (1844); Smith in Koord. & Val., Booms. Java XII, 703 (1910) — *Boehmeria humilis* Miq., Pl. Jungh. 33 (1851).

This disposition of *B. humilis* Miq. was already suggested by Smith l.c., who was, however, not able to examine the type specimen himself.

Boehmeria glomerulifera Miq. in Zoll., Syst. Verz. 101 (1854) and in Fl. Ind. Bat. I, II, 250 (1859) — *Boehmeria depauperata* Wedd. in Ann. Sci. Nat. IV, 202 (1854) — *Boehmeria malabarica* Wedd., var. *depauperata* (Wedd.) in Ann. Sci. Nat. Arch. Mus. Par. IX, 355 (1856) and in DC., Prodr. 16, 1, 203 (1869).

Miquel held quite modern views about the validity of Wallich's catalogue names. It is not clear whether *B. malabarica* Wedd., 1856 (based on *Urtica malabarica* Wall., Cat. n. 4610, 1831 nom. nud.) is indeed specifically distinct from *B. glomerulifera* Miq., 1854. The latter viewpoint is apparently taken by Gagnepain in Lecomte, Fl. Indo Chine V, 2, 840 (1929). Gagnepain distinguishes, next to *B. malabarica* Wedd., a species named *B. Delavayi* Gagnep., the latter, according to Gagnepain, also occurring in Java.

Boehmeria erythropoda Miq. in Zoll., Syst. Verz. 101 (1854) and in Fl. Ind. Bat. I, I, 255 (1859); J. J. Smith in Koord. & Val., Booms. Java XII, 718 (1910) — *Boehmeria caudata* (Burm. f.) J. J. Smith (non Sw.!), var. *pendula* J. J. Smith in Koord. & Val., Booms. Java XII, 708 (1910) (e descript.).

Java, without locality: *De Vriese s.n.* (this specimen shows more complete material than the type specimen of *B. erythropoda*).

Nearly allied to the Brit. Indian *B. platyphylla*, var. *macrostachya* (Wight) Wedd. (*Splitgerbera macrostachya* Wight, 1853; cited by Weddell in DC., Prodr. 16, 1, 211, 1869, also for Java), but the leaves are obtuse, not cordate at base. It is, however, possible that intermediate specimens may be found.

In view of their quite constant and conspicuous distinguishing characters, it seems, in expectation of a new monograph, most practical to treat the Javanese varieties of *B. platyphylla* Don s.l. as distinct species.

Boehmeria ourantha Miq., Pl. Jungh. 33 (1851) — *Boehmeria caudata* (Burm.f.) J. J. Smith (non Sw.!), var. *ourantha* (Miq.) J. J. Smith in Koord. & Val., Booms. Java XII, 713 (1910).

To this species belongs also *Pulle 3141* in Herb. Utr., cited by Koorders, Exk. Fl. Java II, 144 (1912) as *B. platyphylla* Don, var. *tomentosa* Wedd. [*B. tomentosa* Wedd. (1854)]. Yet, Koorders' determination may be correct; the distribution of *B. platyphylla* var. *tomentosa* is, according to Weddell in DC., Prodr. 16, 1, 212 (1869): Madagascar, Brit. India, Java.

Gonostegia triandra (Bl.) Miq. in Ann. Mus. Lugd. Bat. IV, 302 (1869).

An abundantly fruiting, slender species with creeping, radicating stems, small leaves and 3—4-merous male flowers. Generally confused with *G. hirta* (Bl.) Miq., sometimes also with the quite distinct *Pouzolzia zeylanica* (L.) Benn., but recognized by Hallier f. in the Rijksherbarium. Possibly identical with *Pouzolzia parvifolia* Wight, 1853 (Ceylon) and *Gonostegia reptans* Rob., 1911 (Philippines). In Java apparently at lower altitudes than *G. hirta*.

Java, Around Buitenzorg in moist grass fields: *Blume s.n.*: type specimen in Herb. Lugd. Bat.; G. Perbakti, alt. 700 m: *Bakhuizen van den Brink f. 1710* in Herb. Utr.; Tjiboerial, alt. 325 m: *Bakh. v. d. Br. f. 2091* in Herb. Utr.; Preanger: Koorders 34689 β ; Tjidadap, S. of Tjibëbër, alt. \pm 1300 m: *Bakh. v. d. Br. 2422*; Tjiareuj: *Bakh. v. d. Br. 3028*.

The genus *Gonostegia* Turcz. is often reduced to *Pouzolzia* Gaud., but as it is a well-defined group and *Pouzolzia* is not, I prefer to keep *Gonostegia* distinct.

In expectation of the decision of the monographer (a monograph of the genus may be supposed to be in preparation at Breslau), it seems best to use the best known name *Leukosyke* Mor. (1845—46), instead of the older name *Missiessya* Gaud. (1844).

CELASTRACEAE, N. Fl. Part ?, fam. CXXXIII.

(by **G. J. H. Amshoff**)

Celastrus stylosa Wall. ex Roxb., Fl. Ind. ed. Carey II, 401 (1824).

Java, Tjadas Malang near Tjidadap (S. of Tjibëbër): *Bakhuizen v. d. Brink 598* (fr. in VI-1917); Tjibëbër: *Bakh. v. d. Br. 2534* (flow. in VII-1917); Tjadas Malang near Tjidadap, alt. 100 m: *Backer 22483* (12-VI-1907).

New for Java, already known from Himalaya and C. China.

HIPPOCRATEACEAE, N. Fl. Part ?, fam. CXXXIV.

(by **G. J. H. Amshoff**)

Hippocratea macrantha Korth., Verh. Nat. Gesch. Bot. 187, pl. 39 (1839—42); Rolfe in Kew Bulletin, 47 (1918); Ridley, Fl. Malay Peninsula I, 455 (1922); Loesener in Engl. & Prantl., Nat. Pflanzenfam. ed. 2, 20b, 213 (1942) — *Hippocratea Hasseltiana* Miq., Ann. Mus. Lugd. Bat. IV, 154 (1869); Sch.fl. 236.

Java, S.E. Kediri, Damas bay: *Backer 11916* (e. descript.).

The type specimen of *H. Hasseltiana* Miq. (W. Java, bank Panimbang riv.: *V. Hasselt s.n.*) is practically without flowers, but attached to it is

an accurate, if schematic, drawing by Van Hasselt, on which the characteristic indumentum of petals and disc is indicated.

Hippocratea obtusifolia Roxb., Fl. Ind. 170 (1820), sensu lat.; Koord. in Koord.-Schum., Syst. Verz. Fam. 159, 1 (1912); Loesener in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 20b, 213 (1942) — *Salacia javanensis* Bl., Bijdr. 219 (1825); Miq., Ann. Mus. Lugd. Bat. IV, 151 (1869); Sch.fl. 238.

J a v a, Priangan, Palaboeanratoe: *Koorders 34600* β; without locality: *Reinwardt s.n.*

As was already remarked by Miquel l.c., Blume's original label has got lost.

Salacia latifolia Wall., Cat. n. 4222 (1831), nom. nud.; Lawson in Hook., Fl. Brit. Ind. I, 629 (1875); King in Journ. As. Soc. Beng. 65, 366 (1896); Ridley, Fl. Malay Peninsula I, 459 (1922) and in Kew Bulletin 237 (1938) — *Salacia platyphylla* Kurz in Journ. As. Soc. Beng. (1875) teste King l.c. — *Salacia prinoides* (Willd.) DC. sensu Bl., Bijdr. 221 (1825); Korth., Verh. Nat. Gesch. Bot. 184 (1839—42); Miq., Ann. Mus. Lugd. Bat. IV, 184 (1869) (quoad specimina javanica et sumatrana) non (Willd.) DC. (1824); Sch.fl. 237 — *Salacia Naumannii* Engl., Bot. Jahrb. VII, 464 (1886); Loesener in Lauterb. & Schum., Fl. Deutsch. Schutzgeb., Nachtr. 305 (1905), in Engl. Bot. Jahrb. 63, 276 (1930) and in Engl.-Prantl, Nat. Pflanzenfam. ed. 2, 20b, 228 (1942) — *Salacia littoralis* Backer, Fl. Batavia I, 305 (1907) — *Salacia ovalis* Korth. sensu Backer, Sch.fl. 237; Koord., Exk. Fl. Java II, 527 (1912) non Korth. (1839—42).

The first to draw attention to the occurrence of *S. latifolia* outside the Malay Peninsula, i.e. in places in Java, was Ridley, 1938, l.c.; he writes: "This species is really quite distinct from *S. prinoides* DC.", but he continues: "Intermediate specimens I have found in the Malay Peninsula". These intermediates render a clear understanding of both species very difficult. Our Java specimens f.i., on account of their narrow, relatively small, distinctly serrate, short-petioled leaves, narrow filaments and small, 1-seeded fruits, generally identified as *S. prinoides*, show on the other hand the calyx of *S. latifolia*. This Javanese form was described by Miquel l.c. as *S. euonymiflorus* Miq. (a synonym to *S. prinoides* DC.) and is in Java much rarer than the true *S. latifolia*.

A detailed description of *S. latifolia* is given by King l.c.; a few characters however are still worthy of attention:

The fruit of *S. latifolia* is described as mostly 2-seeded (King l.c.: "seeds semiconvex"), Blume l.c. (as *S. prinoides* DC.), Backer l.c. (as *S. littoralis* Backer and *S. ovalis* Korth.), Loesener, 1930, l.c. (as *S. Naumannii* Engl.).

The fruit of *S. prinoides* is smaller and 1-seeded.

The calyx of *S. latifolia* is but shallowly lobed and quite glabrous; the calyx lobes of *S. prinoides* are shortly triangular-ovate and ciliate. According to this character, the Philippine form belongs to *S. prinoides* (Willd.) DC.

In the Javanese specimens of *S. latifolia* the filaments are much dilated towards the base, nearly triangular, in non-Javanese specimens the filaments are usually less dilated, though mostly more so than in *S. prinoides*.

The difference in size of the flowers of *S. prinoides* and *latifolia*, as

given by King l.c. and by Ridley l.c., is greatly exaggerated. Consequently, the position of the form distinguished by King and Ridley as *S. prinoides* DC. var. *macrophylla* (Bl.) King is doubtful. The true *S. macrophylla* Bl., 1825, at any rate, is a species more commonly known as *S. flavescens* Kurz, 1872. The synonymy of *S. macrophylla* Bl. is treated by Backer, 1907, l.c. (as *S. macrocarpa* Korth.) and 1911, l.c., repeated by Koorders l.c. and independently from them mentioned by Loesener in Fedde, Rep. XLIX, 230 (1940).

For Java, *S. latifolia* Wall. has been confused with *S. ovalis* Korth., owing to the fact, that a few specimens, collected but not determined by Korthals, had been incorporated in the Leiden herbarium as *S. ovalis* Korth.

Salacia kalahiensis Korth., Verh. Nat. Gesch. Bot. 183, pl. 38 (1839—42) — *Salacia cerasiformis* Teysm. et Binnend., Cat. Hort. Bog. 219 (1866), nom. nud.

Java, Preanger Palaboeanratoe: Koorders 34502 β (distributed as *S. prinoides* DC.).

Cultivated in the Botanic Gardens of Buitenzorg as *S. cerasiformis* Teysm. et Binnend. A neglected species, allied to *S. prinoides* (Willd.) DC., but distinguished by its smaller flowers (petals \pm 2 mm long) and much less incrassate disc which is distinctly narrowed upwards.

Salacia ovalis Korth., Verh. Nat. Gesch. Bot. 182 (1839—42), non aliorum (see under *S. latifolia* Wall.).

Java, Tjikao, near Poerwakarta: Korthals s.n.: type specimen in Herb. Lugd. Bat.; Semarang, Kedoengdjati: Koorders 25423 β ; Besoeki, Tjoeramanis: Koorders 28743 β , identified as *S. prinoides* DC. by Koorders, as *Salacia* spec. by Backer.

Characterized by its small flowers (petals 1.5—2 mm long), the flattened disc and the dark brown colour of the dried leaf. Also known from Sumatra, Asahan (Yates 1955), Celebes (Rachmat 803) and Soela islands, Taliaboe (Atjè 94 and 236). The first specimen mentioned has been distributed as *S. prinoides* DC.

RHAMNACEAE, N. Fl. Part ?, fam. CXLII.

(by R. C. Bakhuizen v. d. Brink Jr.)

Ventilago madraspatana Gaertn., Fruct. I, 233, tab. 49, f. 2 (1788); Sch.fl. 240.

The original spelling *madraspatana* has to be maintained instead of *maderaspata*.

Ventilago borneënsis Ridley in Kew. Bull. 493 (1931).

New for Java.

Maesopsis Eminii Engl. in Engl. & Prantl, Nat. Pfl. Fam. III, 5, 399 (1896) and in Notizbl. Bot. Gart. Berl. IV, 239—242 (1906) and Veg. d. Erde, Afrika IX, 308, f. 146 (1921).

The description of the genus *Maesopsis* Engl. is based on flowering material of the type species *M. Eminii* and on a fruitbearing specimen of *M. Stuhlmannii* Engl. The last-mentioned species is said to have the fruits surrounded by a free receptacle ("freie Achsenbecher") and to be provided with a lateral style. The Java plant, known as *M. Eminii*, does not show these characters, moreover it does not surpass a height of 5 m, while according to Engler, *M. Eminii* is a large tree with a height of about 30 m.

The Java specimens, however, correspond very well with the figures of a leaf-bearing, flowering twig of *M. Eminii*, pictured in Notizbl. (1906) and in Veg. d. Erde, Afrika (1921), so that we have, in this case, undoubtedly to consider this plant a species of *Maesopsis*. Remains the question, in how far the free receptacle and the lateral style must be considered to have been correctly observed. While describing the genus *Maesopsis*, Engler did not yet know the fruit of *M. Eminii*. Judging from the figure of the fruits of *M. Eminii* in Veg. d. Erde, Afrika, the plant possesses a terminal style, and the fruit is not surrounded by a free receptacle, which is in accordance with the Java specimens. In Veg. d. Erde, a picture in natural size of a leaf-bearing, flowering twig is given by Engler. The measurements from that figure are in accordance with those of the Java specimens, though they are slightly smaller, but the dimensions of the leaves given by Engler in the text do not agree with those from the picture. Yet I do not hesitate to identify the Java plant as *M. Eminii*. The description of the genus *Maesopsis* needs a revision, as it may have been based on mixed data. However, as the type specimens are not at my disposal, I will refrain from an attempt to make an improved generic description.

Rhamnus nipalensis Wall. ex Laws. in Hook. f., Fl. Brit. Ind. 640 (1875).

The original spelling *nipalensis* has to be maintained instead of *nepalensis*.

Colubrina longipes Backer, nov. spec. — *Frutex* erectus ramis floriferis subdependentibus 1.5—2.5 m altus. *Ramuli* teretes tenuiusculi apice flexuosi pilis crispulis brunneis mollibus dense vestiti tarde glabrescentes. *Stipulae* haud conspicuae adpressae, e basi lata abrupte contractae in acumen triangulare subulatumve, ± 0.75 mm longae. *Petoli* 5—12.5 mm longi dense molliterque pilosi pilis brunneis; *folia* e basi obtusissima rotundata truncata vel leviter cordata ovata, apice longe acuminata acuta crasse breviterque mucronata, marginibus leviter crenato-serrata, herbacea opaca, pinninervia basi trinervia, nervis basalibus folii basin haud marginantibus, supra nervos basales utrinque nervis lateralibus 2—4 adscendentibus marginem haud attingentibus percursa, folia novella in tota facie superiore densiuscule vestita pilis longiusculis subadpressis, sensim glabrescentia subtus indumento denso sublanato-tomentoso brunneo persistente vestita, 35—60 mm longa, 20—35 mm lata. *Cymae* (pedunculo 1—3 mm longo, petioli basi brevissime adnato computato) 5—10 mm longae pilis patentibus \pm crispulis longiusculis mollibus brunneis dense vestitae, constantes e floribus σ breviter pedicellatis numerosis, saepe sed haud semper additis floribus 1—2 Herm. longius pedicellatis. σ : Pedicelli pilis \pm crispulis brunneis densiuscule vestiti 2.25—4 mm longi. *Calyx* extus pilis longiusculis brunneis dense vel subdense vestitus, a tubi basi usque ad laciniarum apicem 2.25—2.5 mm longus, pro dimidia parte vel paulo profundius 5-fidus; tubus latus, subcupularis; laciniae ovato-triangulares, acutiusculae intus glabrae. *Petala* brevissime (0.1—0.125 mm) tenuissime unguiculata culcullata lateraliter compressa dorso valde convexa apice rotundata viridia glabra, 1—1.1 mm longa. *Filamenta* 0.75—1 mm longa; antherae convexae ovals 0.25—0.3 mm longae. Discus planus vel levissime cupularis ad staminum insertionem leviter exsculptus pallide viridis flavusve, glaberrimus. *Pistillodium* cras-

sum, levissime 3-lobum, 0.2—0.3 mm longum. Herm.: Pedicelli pilis crispulis dense vestiti sub flore 7—9 mm, sub fructu 15—18 mm longi, graciles apice incrassati. *Calyx*, basi distincte oboconico excepta, ut in ♂. *Corolla* stamina discusque ut in ♂ sed discus suberassior. *Styli* 3 fere a basi liberi filiformes 1—1.3 mm longi; stigmatibus leviter incrassatis. *Drupa* late obovoideo-globosa, \pm 7.5 mm diametens; putamen pericarpio tenuissimo delapso nigrum dissepimentis tenuibus; coccis denique ad angulum internum dehiscentibus; semina late obovoidea a dorso valde compressa apice late rotundata dorso late convexa in facie interiore leviter carinata nitida castanea 4—5 mm longa.

JAVA, E. Java, between Bantoer and Srigontjo, in brushwood, alt. 250 m: *Backer 3869* (flow. and fr. on 10-VI-1912 ♂ and Herm.): type specimen in Herb. Lugd. Bat.; *Backer 4004* (15-VI-1912); Rembang, Forestry district Banjoe Oerip, teak forest on marly ground, some specimens in a flat river valley, alt. 75 m: *Beumée 987* (fr. in VIII-1917).

The specific name alludes to the long-stalked fruits.

Gouania Jacq., *Sel. Stirp. Amer.* 263 (1763).

Gouania L., *Sp. Pl.* ed. II, 1663 (1763) is incorrect, as Linné cites Jacquin as the author of this genus. The original spelling by Jacquin is *Goüania*, named in honour of Goüan or ?Gouan, professor at Montpellier. As I cannot find out which name is the correct one, I retained the current spelling. Kuntze, *Revisio Generum Plantarum* I, 117, follows the spelling of Jacquin.

Gouania Mauritiana Lamk., *Encycl.* III, 5 (1789) — *Gouania javanica* Miq., *Fl. Ind. Bat.* I, I, 649 (1855); *Sch.fl.* 244.

Incorrectly Miquel ascribed to *G. Mauritiana* Lamk. glabrous leaves; consequently he considered the form with ferruginous leaves a separate species, *G. javanica* Miq.

VERBENACEAE, N. Fl. Part 2, fam. CC.

(by A. D. J. Meeuse)

For this family we refer to the paper by A. D. J. Meeuse in *Blumea* V, 1, 66 (15-VI-1942).

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** = nov. spec.; * = nov. comb.; synonyms in italics.

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| <i>javensis</i> Koord. et Val. | 498 | <i>paniculata</i> Roxb. | 503 |
| <i>laxiflora</i> (Bl.) Koord. et Val. | 496 | <i>polygama</i> Roxb. | 503 |
| <i>leptocalyx</i> Val. | 496 | <i>retusifolia</i> Kurz | 503 |
| <i>lineata</i> (DC.) Duthie | 499 | <i>scabrida</i> Wall. | 503 |
| <i>Macromyrtus</i> Koord. et Val. ... | 496 | <i>Gutteria pallida</i> Bl. | 492 |
| <i>microcyma</i> Koord. et Val. | 497 | <i>Gymnopetalum cochinchinense</i> | |
| <i>occlusa</i> Kurz. | 495 | (Lour.) Kurz | 495 |
| <i>opaca</i> Koord. et Val. | 499 | <i>quinquelobum</i> Miq. | 495 |

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| <i>pedatum</i> Bl. | 495 | <i>Myrtus cerasiformis</i> Bl. | 499, 500 |
| HIPPOCRATEACEAE | 517 | <i>glabrata</i> Bl. | 500 |
| <i>Hippocratea Hasseltiana</i> Miq. | 517 | <i>zeylanica</i> L. | 497 |
| <i>macrantha</i> Korth. | 517 | * <i>Neolitsea javanica</i> (Bl.) Backer | 493 |
| <i>obtusifolia</i> Roxb. | 518 | <i>Oppositiflorae</i> Burret | 504 |
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| <i>clavata</i> Korth. | 496 | PAPILIONACEAE | 511 |
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| <i>Horsfieldii</i> Miq. | 501 | <i>Phyllanthus Rheedii</i> Wight | 507 |
| <i>littoralis</i> Bl. | 500 | ** <i>trichosporus</i> Adelb. | 507 |
| <i>marginata</i> (Bl.) Miq. | 500 | <i>Pilea</i> Lindl. | 516 |
| <i>melanocarpa</i> Miq. | 496 | <i>leucophlaea</i> Bl. | 515, 516 |
| <i>polyneura</i> Miq. | 501 | <i>subpuber</i> Miq. | 515, 516 |
| <i>pseudodensiflora</i> Hochr. | 500 | <i>Wightii</i> Wedd. | 515 |
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| <i>virens</i> (Bl.) Miq. | 500 | * <i>cylindrocarpa</i> (Burck) Backer | 493 |
| <i>Vrieseana</i> Miq. | 500 | <i>Pouzolzia</i> Gaud. | 517 |
| <i>Zollingeriana</i> Miq. | 501 | <i>parvifolia</i> Wight | 517 |
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ON A NEW SPECIES OF AXONOPUS FROM SOUTH AMERICA, WITH CRITICAL OBSERVATIONS

by

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(Issued December 31st, 1945).

Some years ago I treated a number of species of the genus *Axonopus* in Blumea IV, p. 510. Among them was *Axonopus Fockei* Henr., based upon Mez's *Paspalum Fockei*, which was published in Fedde's Repertorium XV, 1917, p. 62.

I mentioned Ule's number 8022 as identified by Mez himself being his *Paspalum Fockei*.

When I was preparing work on the grasses of Suriname, many years ago, I asked Prof. Mez to give me information about this *Paspalum Fockei*. The plants collected by Focke were under the charge of the director of the herbarium at Utrecht, Prof. A. A. Pulle, but, although I had at my disposal all the grasses of that collection, no *Paspalum* was found among them which could be the type of duplicate type of Mez's species. Mez's answer to my letter said nothing about the actual type or its whereabouts, but simply stated that Ule's number 8022 (which was in my hands) was his *Paspalum Fockei*, an opinion, accepted by me for the moment.

When I studied the genus *Axonopus* more in detail with the valuable help of Miss Amshoff, many doubts arised as to Mez's species, because Ule's plant no. 8022 did not agree with the description, given by Mez. So we were not satisfied with the data hitherto known and asked for the material at Berlin. After Mez's death his own material was deposited in the Berlin Herbarium and there were indeed two sheets bearing the name *Paspalum Fockei* in Mez's own handwriting. Both sheets were inspected by us. One plant was the number 8022 by Ule, a plant well-known to us, being represented by a very fine specimen in the herbarium at Leiden. On the second sheet in the Berlin Herbarium there was, however, a quite different plant from Suriname and collected by Wulfschlägel no. 581. In our treatment of the grasses in Pulle's Flora, we gave our opinion on p. 346 of Vol. I, part 1, saying that the plant of Wulfschlägel was not the actual type (being not mentioned with the description) but answered to the description of Mez with exception of the length of the spikelets, which were scarcely $2\frac{1}{2}$ mm long, whereas Mez mentioned them as being $3\frac{1}{2}$ mm long. It may be, however, that in the description this is a misprint. We gave in Pulle's Flora a description in the English language.

To compare the various specimens I give here at first Mez's original description of *Paspalum Fockei*:

"Perennis, ad 0.6 m alta, habitu iridaceo. Folia equitantia infima squamiformi-ovata rotundata glabra, superiora e vagina valde carinato-compressa, late lineari, profunde aperta, margine ciliata cet. glabra in laminam optime linearem, apice rotundatam, basi haud contractam, optime carinatam, siccam tota longitudine complicatam, chartaceam, medio non nisi obscure nervosam, glabram, ad 0.15 m longam et 10 mm latam producta; ligulis brevissime truncatis calliformibus, margine dense breviterque pilosis. Culmi erecti, validi, compresso-angulati, praeter nodos barbatos glabri, internodiis quam vaginae brevioribus. Inflorescentia in culmi apice singula, breviter stipitata, folia bene superans, subpauciflora, e spicis ad 4 subaequalibus, subdigitatis, suberectis, haud curvatis, sessilibus, ad insertionis nodulos brevissime pilosis, spiculas laxe distichas nullo modo unilaterales gerentibus, gracillimis, ad 80 mm longis composita; rhachibus valde angulatis nec complanatis, fere omnino rectis, marginibus non nisi minutissime et perobscure serrulatis, in spiculam vigentem desinentibus; spiculis stricte erectis, rhachi appressis, seriei eiusdem sequentibus sese haud attingentibus, plane sessilibus, parce pilosis, sublanceolatis, apice sensim acutis, ad 3.5 mm longis et 1 mm latis; glumis aequilongis, apice acutis vel acutiusculis et hic minutissime ciliolatis, bene 5-nerviis; palea inferore quam glumae sat brevior acutiuscula, straminea, pergamacea, laevi, vix nitidula, apice ciliolata, paleam superiorem rotundatam, apice minute ciliolatam cet. glabram bene superante.

Guyana, Surinam bei Paramaribo (Focke)."

In this description we find some general characters applying to various species of *Axonopus*, but there are a great many data which do not agree with Ule's specimen no. 8022, especially the short inflorescence, consisting of only 4 racemes, is quite distinct from the large panicle with numerous racemes in Ule's plant. Many other characters in the description do not agree with Ule's number as is evident if we compare Mez's description with the plate of Ule's plant given here by me and with my own description of Ule no. 8022.

Wulfschlägel's number agrees much better with Mez's description and because a description prevails and Mez's localities are sometimes erroneous, I accepted *Axonopus Fockei* as a valid species in Pulle's Flora, but at the same time I was convinced that Ule's plant from Brazil belonged to a very distinct and easily recognizable new species.

A recapitulation of the various data is given here.

1. The authentic description was published in the year 1917 with Focke's plant as type specimen from Paramaribo. No such specimen could be located.

2. A sheet from Mez's own herbarium, afterwards in the Berlin Herbarium bears a label in Mez's own handwriting: "Wulfschlägel 581 Pasp. Fockei n. sp." Another typewritten label bears the data: "Carl Mez Herbarium nr. 1.1630. Paspalum Fockei Mez! Wulfschlägel nr. 581".

This specimen has 4 racemes and answers to the description with exception of the length of the spikelets.

3. A sheet of Ule no. 8022 in the Berlin Herbarium is labeled by Mez: "Pasp. Fockei Mez. Carl Mez VI 19." Quite the same plant with

Ule's number 8022 is in the herbarium at Leiden. This number does not agree at all with the description and the Berlin plant was identified by Mez in the year 1919, two years after the publication of his species *Paspalum Fockei* (identification probably by memory).

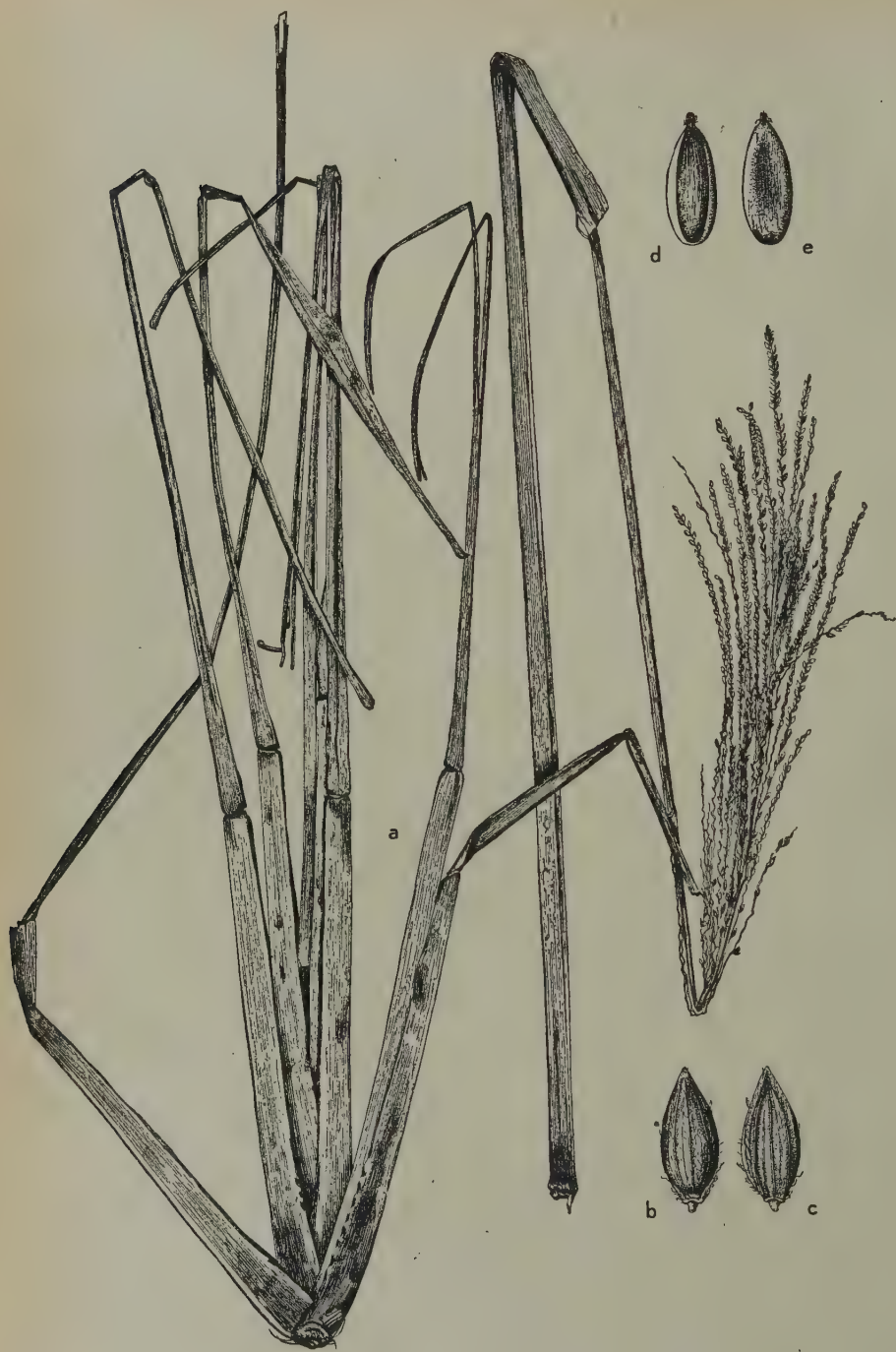
Hence our conclusion is, that the most authentic specimen of *Paspalum Fockei* Mez, answering best to the original description is Wulschlägel's number 581 from Suriname, further that the specimens collected by Ule and named in the year 1919 *Paspalum Fockei* by Mez, belong to a quite different species, which on account of the very characteristic whitish indumentum of all the vegetative parts of the plants, received the name of *pruinus*. I give here the following description:

***Axonopus pruinus* Henr. nov. spec.**

Perennis, probabiliter caespitosus, cum panicula circa 70 cm altus, stricte erectus; tota planta pallida, albido-cinereascens vel inferne ferrugineo-suffusa; vaginae basales valde flabellatae, equitantes, a culmo solutae, ad 20 cm longae, valde compressae, circa 1 cm latae, late carinatae, carina circa 2—3 mm lata; margines vaginarum laxae, leviter apertae, haud involutae, non vel vix hyalinae, glaberrimae, longitudinaliter leviter, ad carinas manifeste striatae, vaginae ad apicem dorso-ventraliter constrictae, quasi sed non vero subarticulatae; folia rigida, laminae e basi subrotundata circa 6 mm latae, sensim angustatae, 30—40 cm vel interdum plus longae, interdum superne ad circa 1 cm latae, inferne canaliculato-complicatae et tunc circa 5—6 mm latae, haud acuminatae sed apex valde obtusatus, arcuato-scariosus, quasi appendiculatus, fusco-coloratus; laminae marginibus glaberrimis, vel ad basin puberulis, haud membranaceis, longitudinaliter striatae; ligula brevissima, dense sed breviter ciliata, pallide fusca; culmus validus, subarundinaceus, sine panicula ad 50 cm altus, compresso-carinatus, 4—8 mm latus, stramineus, glaberrimus, vaginis laxissime circumdatus, nodo unico paullo infra $\frac{1}{2}$ culmi sito, breviter adpresse sericeo; panicula ad 25 cm longa, contracta, rhachi ramisque angulosis, racemi numerosissimi, secus axin communem glaberrimum alterni, stricte erecti; rhachi depressotrigona, basi in axillis breviter vel minute puberula, ceterum glabra, pedicelli spicularum ad rhacheos nodulos singuli, brevissimi, glabri; spiculae ovato-lanceolatae, acutae, ad $2\frac{1}{4}$ mm circa longae, 1 mm latae, leviter sparse pilosae, gluma prima deest, glumae II et III subaequilongae, tenuiter membranaceae, 5- et 7-nerves, nervi alternatim crassi et tenues, crassioribus ad apicem anastomosantibus; lemma fertilis (IV) spiculam subaequans, linearilanceolata, leviter acuminata, pallida, marginibus inflexis, ceterum vix vel minutissime puncticulata, apice distincte setuloso-ciliata.

America meridionalis: Brasilia, Rio Branco, Surumu, in montibus prope Quarai, Muia superior, Febr. 1910. E. Ule. Herbarium Brasiliense, no. 8022. Typus speciei in Herb. Lugd. Bat. sub no. 915. 106—372.

Important differences with the true *Axonopus Fockei* (taken from Mez's own description) are that in Mez's species the blades are not contracted at the base, the ciliate sheath-margins and the few-flowered inflorescence, consisting of only 4 subdigitate racemes. Probably constant differences of *Axonopus Fockei* with the new species are also the sericeous collar at the junction of the blade and the sheath and the summit of the leaves, which is acutish, puberulous and not provided with the scarious appendages.



These characters are found in both specimens, Wullschlägel 581 and Splitgerber no. 724 together with the other specimens mentioned in the Flora of Suriname. Moreover, the whitish indumentum of Ule's species is not mentioned by Mez and the specimens accepted in the Flora of Suriname have dark-green foliage. Mez's species was described from Paramaribo, a coastal region, whereas Ule's plant is a mountain-species.

When I treated some species of the genus *Axonopus* in Blumea IV (1941), I mentioned the beautiful species with white hairs instead of golden ones in the panicle, from Guiana and described by Doell as *Paspalum senescens*. I made a new combination for this species in the genus *Axonopus*, but unfortunately I wrote *canescens* instead of *senescens*. The combination *Axonopus canescens* (Doell) Henr. is wrong, there is no *canescens* by Doell, although there is a *canescens* by Nees. I accept the opportunity to rectify this error.

***Axonopus senescens* (Doell) Henr.** is the correct name, based on Doell's *Paspalum senescens*; a name to change in the index on p. 536.

The common carpet grass *Axonopus compressus* (Sw.) P. B. is found throughout tropical America, in the West Indies and in the southern parts of North America. This species is evidently introduced in the Old World but is according to Stapf a member of the tropical African Flora, where it is found in Upper and Lower Guinea. Having seen some specimens from both regions, mentioned by Stapf, I found that there are some striking differences between the specimens from West Africa and the New World ones.

The spikelets of the West African plants are much longer, and both outer scales much overtop the fertile lemma, they are only up to 2.8 mm long in the typical *Axonopus compressus* but are in the West African ones up to 3½ mm long in the specimen collected by Hens and 4 mm or even longer in a specimen collected by Pobéguin.

When I saw the latter in the herbarium at Paris I noted it as a distinct species but I prefer to accept the West African members of *Axonopus compressis* as a subspecies as follows:

***Axonopus compressus* (Sw.) P. B., subsp. *congoensis* Henr., nov. subsp.**

Differt a typo praesertim spiculis longioribus, ad 3.5—4 mm vel paullo plus longis, glumis haud raro ad 7-nervis, foliis vulgo angustioribus.

Africa occidentalis, Guinea inferior, Congo Belgica, M'Sonata, 1000 ped. loco sabuloso, leg. Fr. Hens anno 1888. Série C. no. 162. Typus in Herb. Lugd. Bat. sub no. 908. 146—1416.

Huc pertinet etiam:

Guinea superior, Congo Gallica, prope Timbo, leg. Pobéguin no. 1703 vid. in Herb. Paris.

Explanation of the plate. a. Whole plant $\frac{2}{5}$ natural size; b. and c. two spikelets back and front side, magnified 8 times; d. and e. fertile lemmata from both sides, magnified 8 times.

A NEW PUCCINELLIA-SPECIES

by

P. JANSEN

(Amsterdam).

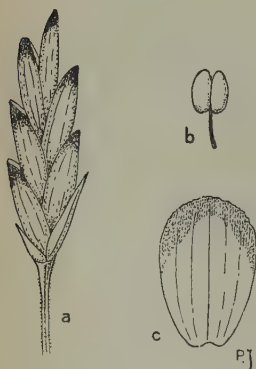
(Issued December 31st, 1945).

Among a set of duplicates of *Puccinellia*, which I received through the courtesy of Dr C. Blom (Göteborg, Sweden), I found the following new species.

Puccinellia Blomii, nov. spec.

Perennis; multicaulis; culmi erecti, firmi, ad basin innovationibus paucis intravaginalibus circumdati, cum panicula 40—70 cm alti, teretes et laeves, summum nodis 3. Folia lamina glauca, rigida, arcuata linearis, ad basin plana, 4—5 cm lata, apice complicata, sicca \pm involuta, in foliis inferioribus 15 cm longa, in superioribus brevior (5—6 cm) nervis latis, superne scabris, subtus glabris. Vagina striata, glabra; ligula membranacea hyalina, apice rotundata erosula, circ. 6—7 mm longa. Panicula ampla, pyramidata, rhachi erecta, rigida e vagina suprema exserta, usque ad 25 cm longa et 12 cm lata, desuper visa circiter rhomboidea; semiverticelli divergentes, ramis 5—7; rami scabri, basi calloso-incrassata, parte basali brevi nuda, sub anthesin erecto-patentes, post anthesin patuli vel retroflexi. Spiculae angustae lineares, \pm 7 mm longae, floribus 5—7 non remotis (rhachillae internodiis 1 mm longis), pedicellatae; pedicelli 3—8 mm longi, scabri, apice incrassati. Glumae 2, cymbiformes, acutae, valde inaequales, inferior brevior, triquetra, 1-nervia, 1 mm longa, superior ovata, dorso rotundata, 3-nervia, 2 mm longa et ultra. Glumella dorso rotundata vel paullo sub medio carinata, ovato-elliptica, obtusa, apice erosula, non vel angustissime hyalino-marginata, 2 mm longa, obscure 5-nervia, glabra, viridis, superne violacea. Palea brevior, marginibus inflexis, 2-dentata, ad carinas ciliolata. Antherae minimae, 0.5—0.6 mm longae et latae. Caryopsis ovalis, hilo parvo, ovali; styli 2, usque ad basin liberi.

This species seems very similar to the South-European *Puccinellia*



Puccinellia Blomii P. Jansen, n. sp. — a. Spikelet, \times 5; b. Anther, \times 10; c. lemma, \times 10 — after the type specimen.

palustris Hay. by the light green colour of leaves and culms and the large pyramidal panicle; but it differs from that species by the smaller flowers and the very much smaller anthers. It is very variable in size. In weak specimens the leaves are shorter, narrower and often subulate. Such plants come very near to *Puccinellia argentinensis* Hack., from which species they differ in the widely open all-sided panicle and the rounded top of the valve (lemma).

Sweden, Skåne, Lackalänga, on woolrefuse: *C. Blom s. n.*, 19.6.1932 (type specimen *Herb. Lugd.-Bat.* no. 945.117-31); same locality: *Id. s. n.*, A° 1933 (*Herb. L.-B.* ns. 945.117-32 and 945.117-33).

Patria ignota (forsan *America australis*?).

Dr C. Blom found a rather large number of specimens on woolrefuse at Lackalänga, Skåne, Sweden. This woolrefuse was of Australian, South-African and South-American origin. It is, however, not very probable, that Australia or South-Africa should be the native country of the new species. From Australia only a few *Puccinellia*'s are known, belonging to another section (with the exception of the common *Puccinellia distans* Parl.) From South-Africa are only known: *Puccinellia angusta* Sm. et Hubb., *Puccinellia acroantha* Sm. et Hubb., *Puccinellia fasciculata* Bickn. and its variety *caespitosa* Jsn.; they all show a different character of growth and have different spikelets and flowers. South-America on the other hand, should sooner be considered. At the same locality in Lackalänga, Dr Blom found, for instance, many specimens of *Puccinellia glaucescens* Par. (= *P. Osteniana* Pilg.), a species known from Chili, Argentina and Patagonia. *Puccinellia Blomii* is certainly related to *Puccinellia glaucescens*; both species show the same small anthers. But the latter species differs from the former by the narrow, contracted panicle, not quite exerted from the uppermost sheath, the larger more-flowered spikelets, the pubescent base of the valve and the short ligula.

VARIABILITY OF THE FEMALE REPRODUCTIVE ORGANS IN GINKGO BILOBA L.

by

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(Botanical Laboratory, University of Leyden).

Introduction.

In 1915 Worsdell signed: "The object of botanical investigation, in whatever department, should be to determine, as far as possible, the inter-relationship of the various facts which are accumulated and arrange them accordingly; and not merely, as has for so long been the custom, to pile them in chaotic heap."

This is quite true; only too often the facts have been piled in a chaotic heap. This has been the case with investigations on the nature of the reproductive organs, both female and male, in *Ginkgo biloba*. An extenuating circumstance, however, is the great variability in the afore-said organs; so great a variability indeed that one hesitates to tackle the subject, for fear that it will appear to be still greater than was previously supposed.

It is perfectly unnecessary to state once more that *Ginkgo* is a very remarkable tree, less known is the fact that the variability in the female reproductive organs is very considerable, not only in one plant at one moment, but in relation to time too. It makes a difference, whether a *Ginkgo* tree is young or old. So great is the variability that quite common variations have been termed "abnormalities".

Material.

From a number of trees seeds were obtained. In the first place the tree in the Botanic Garden of Leyden has to be mentioned. From this tree planted in 1850, a large number of seeds has been collected in 1940 by Jonkheer W. C. van Heurn. I could investigate these seeds by the courtesy of the curator of the Rijksherbarium at Leyden Dr S. J. van Ooststroom, to whom they were originally presented. In 1943 a still greater quantity was collected from the same tree. In the same year seeds were also received from trees growing at Slikkerveer, 's Graveland, and Maastricht. For the receipt of these seeds I should like to thank Jonkheer W. G. Groeninx van Zoelen van Ridderkerk, Mr P. G. van Tienhoven, and R. Schoenmakers respectively. The tree at Slikkerveer was the same from which in 1914 Affourtit and La Rivière (1915) received their material.

Furthermore the Leyden tree supplied plentiful material for the investigation on the variability of the female "inflorescences".

Variability of the female "inflorescences".

Since many years the nature of the female reproductive organs of Ginkgo has been a subject of much discussion. Pilger (1926) gives a review of the literature on this subject, while Zimmermann (1930) discusses the "flower" of Ginkgo as an example of a phylogenetic problem. This author prefers to call the female reproductive organs "Makrosporangienstände", macrosporangiphores, and says: "Wir wenden uns gegen den weit verbreiteten Glauben, ein Problem wie die Phylogenie der Ginkgo-sporangienstände sei dadurch zu lösen, dass man derartige primitive Bildungen hineinpresst in Begriffe, welche von typischen oder höheren Pflanzen gewonnen sind, das sind in diesem Falle die uns geläufigsten Pflanzen, die Koniferen und die Angiospermen."

We shall take Zimmermann's advice to heart and call the "flower" of Ginkgo a macrosporangiphore.

a. *Number of macrosporangiphores on the brachyblasts.*

The Ginkgo tree bears branches with both long and short shoots, the latter are the so-called brachyblasts. Generally, it takes some years before the brachyblasts become fertile. It occurs rather frequently that the brachyblasts form a long shoot at their top. Next year the buds of these secondary long shoots develop into fertile brachyblasts. These we will call "young brachyblasts" in contradistinction with the ordinary fertile short shoots, which we will call "old brachyblasts".

Some authors have procured information as to the number of macrosporangiphores on the brachyblasts. According to Carothers (1907) the number of macrosporangiphores varies from one to six. De Haan (1920) mentions this number also, but says that it is mostly five.

In the present investigation, however, a somewhat greater range was found, the number varying in older brachyblasts from one to eight, in younger ones from one to six (cf. *Table I*).

TABLE I (cf. *Fig. 1*).

Number of macrosporangiphores on the brachyblasts.

| Number of macrosporangiphores on brachyblast. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|--|---|---|---|---|----|----|---|---|
| old brachyblasts | 2 | 4 | 5 | 9 | 13 | 13 | 9 | 2 |
| young brachyblasts | 2 | 5 | 6 | 6 | 5 | 2 | — | — |

From this table and from *fig. 1* it may be seen in the first place that the number of macrosporangiphores may be higher than six. Probably this number will appear to be still higher on studying very old and well

outgrown short shoots. Secondly it appears that the variability in young short shoots is much less than in older brachyblasts — a phenomenon we will encounter again — and that the maximum lies at 3—4, against 5—6 in the older brachyblasts.

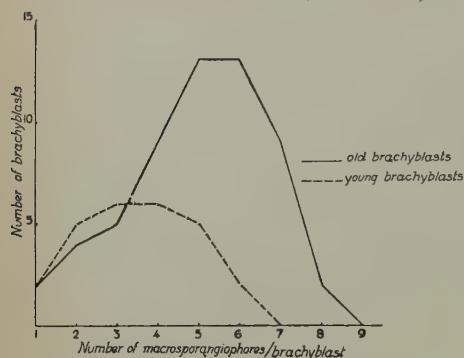


Fig. 1 — Number of macrosporangioophores in young and old brachyblasts.

b. Variation in the shape of the macrosporangioophores.

It is a well-known fact that the shape of the macrosporangioophores may be very different. However, the various authors do not agree as to this point. The reason of this dispute is the great variability in relation to the age of the Ginkgo trees investigated.

Strasburger (1879) described female sporangioophores in which the stalk bore four ovules supported on slender stalklets.

Von Wettstein (1899) makes a subdivision of his material into two groups, normal flowers (von Wettstein calls the female reproductive organs of Ginkgo flowers) with two sessile ovules, and abnormalities. These abnormalities can, according to von Wettstein, be arranged into four categories:

- flowers with two more or less stalked ovules,
- flowers with more than two sessile ovules,
- flowers with more than two stalked ovules,
- flowers with only one ovule.

Representatives of the first category are, according to von Wettstein, restricted to the axils of leafy bud scales, and nearly always a little bud is found between the stalklets of the ovules. Representatives of the second category, however, show a positional preference for the axils of the uppermost normal fertile leaves. Mostly there are three, more rarely four sessile ovules.

Von Wettstein considers the first group primitive and atavistic in relation to the so-called normal flower, while the second category is interpreted as a splitting and an advanced character. The third and fourth group do not seem to be very important to von Wettstein, since they are not mentioned in detail. The following quotation gives an impression of von Wettstein's point of view: "Der im Vorstehenden beschriebene Bau der normalen Blüte und der von mir untersuchten Abnormalitäten spricht unbedingt dafür, dass die normale Blüte von Ginkgo aus einem Gebilde besteht, das einem bloß zwei transversale Fruchtblätter tragenden Sprosse gleichwertig ist. Durch Auseinanderweichen der beiden Blätter und stielartige Ausbildung ihrer Basis entstehen die gestielten Samenanlagen, durch Theilung der Fruchtblätter 3—4-samige Blüten, durch Ausfall eines der Fruchtblätter 1-samige Blüten."

Celakovsky (1900) also studied the macrosporangiophores and does not agree with von Wettstein regarding the following point. According to Celakovsky three ovules do not originate by a *dédoublement* of one of the two ovules of the normal flower, but in the case of three ovules these are always equally stalked, while von Wettstein only saw three sessile ovules. In our opinion the solution of this controversy is that both authors did not see sufficient material, probably since the trees were too young. In material obtained from more aged trees both cases occur.

Sewards and Gowan (1900) described some abnormal forms of female flowers, one in which the peduncle bears three stalked ovules and a lateral unexpanded bud, another where five ovules are extant.

Von Spiess (1902) studied the macrosporangiophores of *Ginkgo* in relation to *Cephalotaxus* and *Taxaceae*. According to this author there is no such thing as a small bud between two stalked ovules. His material, however, was certainly not sufficient to decide upon this point.

Sprecher (1907) published a monograph on *Ginkgo*. In a paragraph on the "Anomalies de la fleur femelle" he gives an exposition of the nature of abnormalities, considering two sessile ovules as normal. Concerning *Ginkgo* the author says: "Les anomalies dont je vais parler sont de nature atavique ou peut-être quelquefois des phénomènes de mutation; les caractères latents se sont développés sous l'influence du milieu ambiant."

Sprecher investigated a great number of female brachyblasts: 28 % had normal flowers, 72 % showed both normal and abnormal flowers. The material hailed from a relatively young tree. From a much older tree the material showed a greater percentage of abnormalities.

Ten groups of abnormalities have been described by the author:

- a. three sessile ovules,
- b. two stalked ovules,
- c. three ovules on two stalklets, one solitary and two fused ovules,
- d. one solitary ovule,
- e. six stalked ovules,
- f. four sessile ovules,
- g. four ovules fused by twos,
- h. four stalked ovules,
- i. six stalked ovules, the seventh sessile,
- j. three stalked ovules.

Sprecher did not see the variation described by von Wettstein, in which a small bud occurred between two stalked ovules, neither did he see the abnormality described by Seward and Gowan with three stalked ovules and a small lateral bud.

Worsdell (1916) writes in his *Principles of Plant-Teratology*: "The uni- or biovulate axis of the maidenhair tree (*Ginkgo biloba*) may proliferate in the sense that it bears a greater number of ovules which then become stalked and may be spirally arranged." Later on the same author says furthermore: "In the maidenhair tree (*Ginkgo biloba*) we find abnormally an increase of the number of carpels (here reduced to ovules), which also become long-stalked; doubtless a case of reversion, the normal female flower of *Ginkgo* being palpably a reduced structure."

De Haan (1920) is the first author, who discovered that there is a

certain regularity in the occurrence of abnormal flowers, or as the author calls them "strobili". Of the 114 examined brachyblasts were 76 in which the first strobilus, standing in the axil of a budscale, had an abnormal shape, that is to say was split, or had only one terminal ovule, or was in some other way curiously formed. Their dominating feature was the division in slender stalklets with one terminal ovule, contrary to the normal strobilus with sessile ovules. According to the regularity in the occurrence of certain forms of strobili the author says: "The first strobilus always arising in the axil of a budscale, has sometimes an abnormal form, as I mentioned before. The second strobilus, also standing in the axil of a budscale is normal, in nearly all cases bearing two sessile ovules. The third one sometimes, and nearly always the fourth, standing in the axil of an ordinary leaf, bears three sessile ovules. The number of ovules on the fifth strobilus is very different and often they are less developed. The frequency of four sessile ovules is greatest on this strobilus. Sometimes there is a sixth strobilus, which again bears two normal ovules."

De Haan concludes from the fact that, as he puts it, the lowest bud-scales are the most primitive, that the first strobili, developing, from the axils of those primitive bud-scales represent the most original case. According to him, the arrangement of the ovules on the strobilus is just the same as the position of the leaves on the ordinary long shoot, the one or two lowermost pairs being decussate, the others in a spiral order. Unlike von Wettstein, De Haan says: "Therefore it is clear, that in the now existing reduced strobili, on which only the lower sporophylls are developed, these are decussate, but it may not be called the normal order, this being the spiral one."

The work of De Haan does not seem to have drawn the attention it deserves. Pilger (1926), in his revision of the Ginkgoales in Engler-Prantl, only gives the title of De Haan's thesis, but does not quote him and only mentions the incomplete work of von Wettstein. As a matter of fact I did not see De Haan's publication until after having come to similar, though in some respects less complete results. The time of getting good material was over then, as the bud-scales and many macrosporangioophores had fallen off by that time.

Schaffner (1927) studied the form of the young female reproductive organs in relation to their morphological nature. He arrived at the conclusion that these are megasporophylls and drew the attention to the fact, that the normal shape is dorsiventral. At one side there exist a groove between the ovules, at the other side there is a prominent flat surface, the leaf, ending in a ridge. As a matter of fact female organs of this description are often to be found.

It is, however, very difficult to explain the structure of the more complicated macrosporangioophores in the light of this hypothesis. The author says to this point: "The abnormalities which have been observed by various investigators are plainly in agreement, for the most part at least, with the view that the structures are sporophylls, although conclusions drawn from monstrosities are in general of little phylogenetic significance." It is evident that this is no great help.

Finally in 1929 Sakisaka published an article on the seed-bearing

leaves of Ginkgo. This author gives some data on the frequency of the number of ovules on the macrosporangiophores. No attention, however, is drawn to the fact that macrosporangiophores with two, three or four ovules may show an entirely different structure. Furthermore the impression is gained, that in the material investigated, sporangiophores with more than five ovules were not found. The illustrations, however, show that seven and even ten ovules have been found.

The Leyden tree, which was planted in 1850, provided us with plentiful material; more than two thousand sporangiophores could be investigated. Material collected in 1913 has been conserved in the Rijksherbarium Leyden. This proves that Affourtit and La Rivière (1915) were right in saying that the tree had flowered during recent years.

When studying the fertile brachyblasts it is obvious that there exists a certain coordination between the shape of the leaves and the structure of the macrosporangiophores. As several authors have observed, the more complicated macrosporangiophores are always standing in the axils of bud-scales. From a budscale an uninterrupted series to a green reduced leaf may be observed (cf. *fig. 2*). This figure is, in a way, a least common



Fig. 2 — Relation between the type of macrosporangiophores and the shape of the corresponding leaves.

multiple, which in this form never occurs in nature; there are, for instance, too many bud-scales and too few leaves in this series.

We have subdivided the macrosporangiophores into four groups:

- a. branched macrosporangiophores with 8—3 stalked ovules (*fig. 2a*),
- b. macrosporangiophores with 2 stalked ovules (*fig. 2b*),
- c. "normal" macrosporangiophores with 2 sessile ovules (*fig. 2c-f*),
- d. "normal" macrosporangiophores with 3 or 4 sessile ovules (*fig. 2g*).

These groups are to be subdivided into smaller categories, group a according to the number of ovules, group b into the three following smaller groups:

- 1. with a small bud between the 2 ovules,
- 2. without such a bud,
- 3. with the stalk split down to the base and one of the two halves aborted.

Group c. is subdivided into two groups, one with, the other without a rudimentary fissure between the two ovules (*fig. 2c* and *d-f*). The last group, finally, is to be subdivided into two groups according to the number of ovules.

TABLE II (cf. *fig. 3*).

Number and nature of ovules in the macrosporangiophores.

| Group | a | | | | | | b | | | c | | d | |
|------------------------|---|---|----|----|----|----|---------|---------|----|-----------|-----------|-----|----|
| Number of ovules | 8 | 7 | 6 | 5 | 4 | 3 | 2 + bud | 2 — bud | 1 | 2 + fiss. | 2 — fiss. | 3 | 4 |
| old brachyblasts | 3 | 8 | 13 | 12 | 34 | 45 | 24 | 158 | 9 | 154 | 706 | 187 | 22 |
| young brachyblasts ... | | | | | 5 | 11 | 6 | 105 | 37 | 78 | 508 | 31 | 1 |

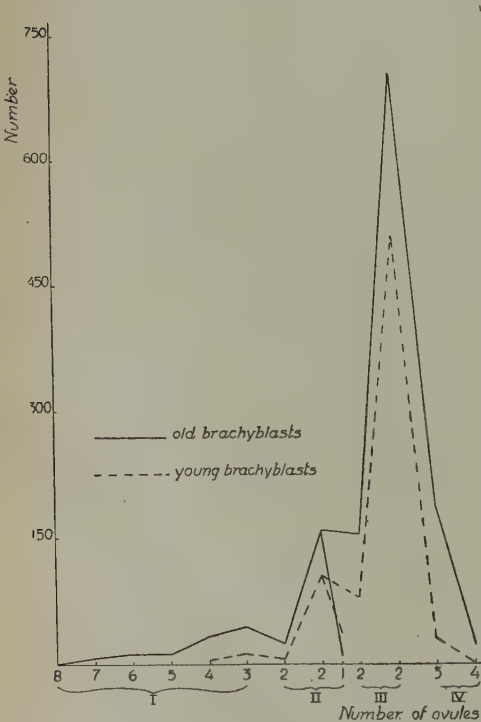


Fig. 3 — Relation between different types of macrosporangiophores in young and old brachyblasts.

From *Table II* several points are apparent. First of all the variability is not as great in young brachyblasts as it is in older ones; the age of the brachyblast seems to be an important factor. Possibly the age of the tree has a similar influence.

By plotting these data into a diagram (*fig. 3*) it is apparent that while the width of the variability is greater in the old brachyblasts, the nature of the variability is perfectly the same in both types. Another point of interest is the occurrence of single ovules. This type is to be found on a much larger scale in young brachyblasts than in older ones. Because of the great number of macrosporangiophores (1475 in old and 782 in young brachyblasts respectively) it is not very probable that this is a mere chance. Other points becoming obvious in young brachyblasts is the absence of the more complicatedly branched macro-

sporangiophores, while representatives of group d are rare or very rare.

By determining the nature of the leafy organ from whose axil the sporangiophores arise, we obtain more information as to the nature of the variability of the female reproductive organs of *Ginkgo*. It is possible to make a subdivision into a group with the sporangiophores situated in the axils of bud scales (*fig. 2 a-c*) and another with the sporangiophores in the axils of leaves (*fig. 2 d-g*). The results are given in *Table III*.

TABLE III (cf. *fig. 4*).

Number and nature of ovules in the bud scale- and leaf-axil
macrosporangiophores.

| Group | a | | | | | | b | | c | | | d | |
|--|---|---|---|---|----|----|------------|------------|----|--------------|--------------|-----|----|
| Number of ovules | 8 | 7 | 6 | 5 | 4 | 3 | 2 + bud | 2 — bud | 1 | 2 + fiss. | 2 — fiss. | 3 | 4 |
| old brachyblasts (bud scales) | 3 | 8 | 8 | 7 | 22 | 34 | 18 | 109 | 6 | 86 | 63 | 3 | 1 |
| old brachyblasts (leaves) | | | | | | | | 2 | 2 | 34 | 446 | 144 | 17 |
| young brachyblasts (bud scales) | | | | | 5 | 8 | 4 | 86 | 31 | 54 | 83 | 1 | |
| young brachyblasts (leaves) | | | | | | | | | | 13 | 418 | 28 | |

This table elucidates several other points. The range of the variability for both bud scales and leaves of young brachyblasts is less than is the case with the same organs of old brachyblasts. Furthermore it is obvious that representatives of group a never, those of group b are very rarely situated in the axils of leaves. On the other hand representatives of group c are preferably extant in the axils of leaves. Here again the large number of sporangiophores investigated, 368, 645, 272, and 459 respectively, are a guarantee for the correctness.

In *fig. 4* the data for the two categories of old and young brachyblasts are brought together; the group of single ovules is left out for clearness' sake.

De Haan (1920) denies the possibility, produced by von Wettstein (1899), that the decussate arrangement of the sporophylls is the normal order. According to De Haan only the first one or two pairs of sporophylls are decussate, the rest being arranged in a spiral order. Many of the macrosporangiophores investigated by us show 6 or 8 ovules in 3 or 4 decussate pairs. The morphology of the branched macrosporangiophores needs a closer investigation.

Thusfar all investigators have spoken of abnormalities. All macrosporangiophores of *Ginkgo* except those of group c (right hand column)

have been termed abnormal. However, from the investigations by von Wettstein (1899), Sprecher (1907), and De Haan (1920) as well as from

our own data it is evident that it is not allowed to speak of "abnormalities". Their occurrence is by no means a haphazard one; it is distinctly liable to definite rules. The deeper sense of these rules, however, is still unknown. With Von Wettstein we are inclined to speak of reduction in group a-c and of progression in group d as the series described is identical with that occurring in the brachyblasts.

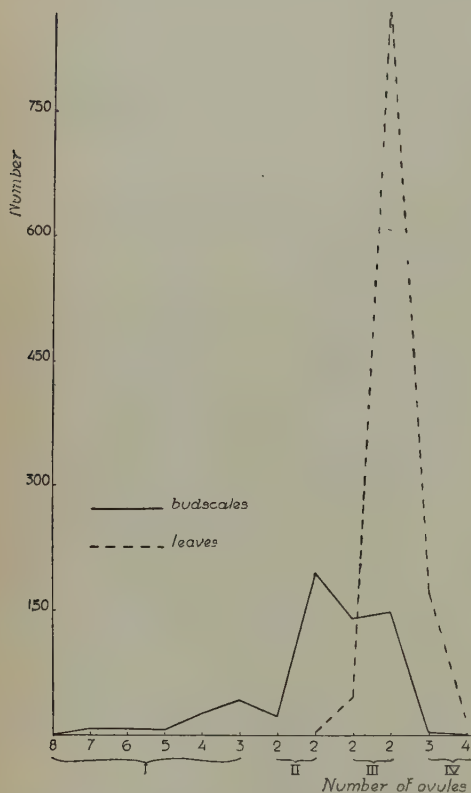


Fig. 4 — Relation between different types of macrosporangioophores and the shape of the corresponding leaves.

Slikkerveer and Maastricht seeds have a yellow hue. Among those from Slikkerveer a very great number — about 80 % — were much smaller than the rest, about as big as a small cherry (*fig. 5, ns. 1 and 2*). By investigating the kernels of the latter type it appeared that these were very small indeed. There seems to be a correlation between the dimensions of the stone and of the whole seed. We did not see this variation in the Leyden material, while there was only one specimen in the material from the Maastricht tree.

Among the material from Leyden and Maastricht — and one case in the material from Slikkerveer — several seeds were found with a more oblong shape (*fig. 5, ns. 3 and 4*), sometimes even with a more or less sharp apex (*fig. 5, n. 5*). It appeared that the kernel was congruent to this shape, being slender and sometimes with an acutely beaked apex. Very rare is the occurrence of pear-shaped seeds (*fig. 5, ns. 6 and 7*).

Variability of the seed.

a. Differences in the shape of the seeds.

In the autumn and the early winter of 1943 a great number, in total 3193, of ripe seeds from trees at Leyden, Slikkerveer and Maastricht have been investigated, 2474, 558 and 161 seeds respectively.

The seed of Ginkgo consists of a kernel covered with a fleshy sarcotesta. Generally the seed has the shape of a small plum. The colour is yellow to orange-yellow. The seeds of the Leyden tree are more or less apricot-coloured, the

Finally we found an aberrant form (fig. 5, ns. 8 and 9) 29 times in the Leyden, 7 times in the Maastricht, and only once in the Slikkerveer material. On the outside the abnormality consists of the entrance of the

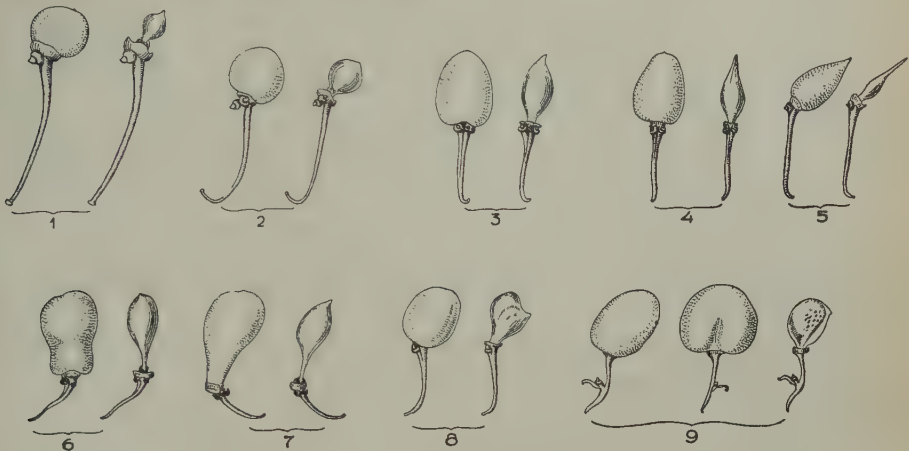


Fig. 5 — Shapes of seeds and kernels, of each pair on the left the intact seed (with sarcotesta), on the right the kernel only.

- 1—2 cherry-like seeds from Slikkerveer.
 3—5 oblong seeds, 3—4 from Leyden, 5 from Maastricht.
 6—7 pear-shaped seeds from Leyden.
 8—9 seeds with lateral pollen-chamber from Leyden.

pollen-chamber being laterally situated. On dissecting the seed the kernel was always found to be abnormal, in as far as its shape is irregular, while the sclerotesta — wall of the stone — is often deficient.

From the above it appears that practically always the shape of the stone may be predicted from the shape of the intact seed.

b. *Length of the seed-stalk.*

In the material investigated from the Leyden, Slikkerveer and Maastricht trees the length of the seed-stalk was most variable. It appeared that the stalks of the Slikkerveer seeds are much longer than those of the Leyden ones, the material of Maastricht taking an intermediate position (*Table IV*).

TABLE IV (cf. fig. 6).

Length of seed-stalk.

| Origin of the material | Number of stalks | Length in cm |
|------------------------|------------------|---------------|
| Leyden | 34 | $2.7 \pm .08$ |
| Maastricht | 106 | $3.6 \pm .07$ |
| Slikkerveer | 250 | $4.1 \pm .04$ |

From *Table IV* it is obvious that the differences found are real. In order to make the graphs of the Slikkerveer and the Maastricht material comparable, the latter has been multiplied by $2^{1/3}$ so as to obtain the same

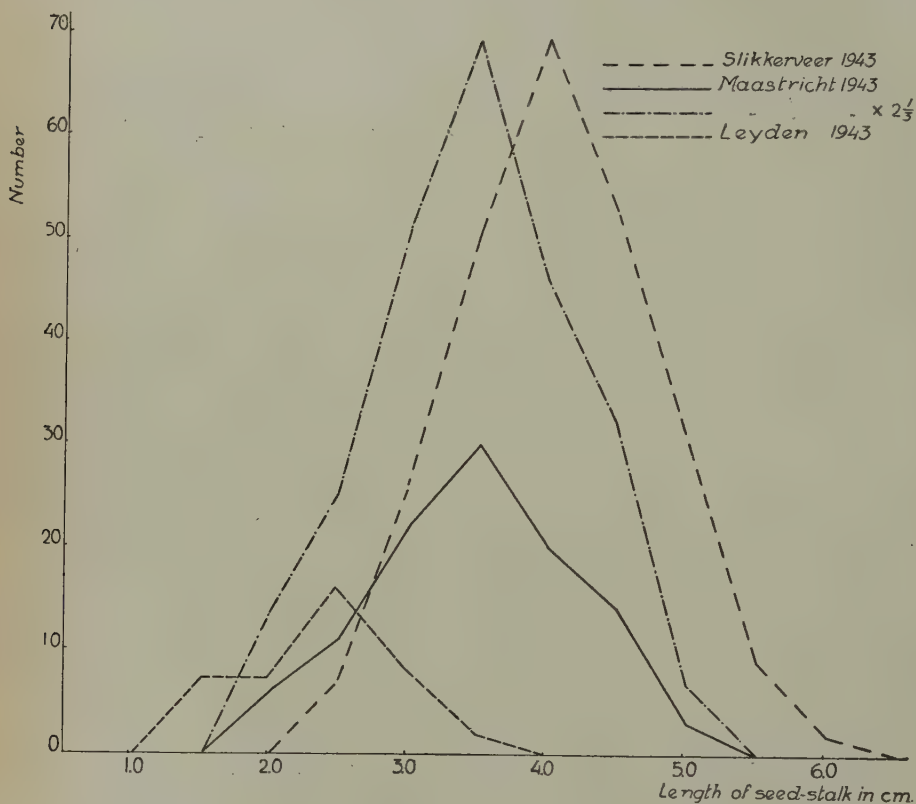


Fig. 6 — Length of seed-stalk. Material from Slikkerveer, Maastricht and Leyden.

height as the graph of Slikkerveer. The graphs appear to be normal variation curves, although the Leyden material was rather too scanty.

c. Variation in the shape of the kernel.

Affourtit and La Rivière (1915) studied the variations of the kernel of Ginkgo seeds on a relatively small number (117). We had an opportunity to study a much richer material (cf. *Table V*) from various sources.

It appeared that there are some variations, which thusfar seem to have escaped the attention. In addition our material enabled us to give a classification of the different possibilities in the shape of the kernel. A third point of interest is the fact that we had an opportunity to study material from the identical tree, whose seeds were studied by Affourtit and La Rivière.

Concerning the external shape of the sclerotesta the literature has

been given by the above-mentioned authors. In most cases the stones are two-ribbed, but three-ribbed ones are by no means rare, one-ribbed stones are rare and four-ribbed ones extremely so.

As to the cause of the occurrence of two or three ribs, there are several authors who gave their opinion on this problem.

Carothers (1907) mentioned the following facts: "At the base of the ovule two bundles enter the watery tissue, coming up through a little gap in the tissue of the stony coat... In some cases there is a three-lipped integument and a three-angled nucellus, there being also three bundles, one ending in each angled side."

Sprecher (1907) gives more or less the same points: "Dans les semences à trois côtes le parcours des faisceaux libéro-ligneux est pareil, avec cette différence que nous avons trois faisceaux entrant dans la même semence donnent naissance à un noyau à trois côtes prouve que celui-ci est en rapport intime avec les cordons ligneux... une ouverture bilabiale, le micropyle. Parfois cette ouverture est trilabiale; c'est probablement le cas lorsque les semences sont destinées à avoir trois côtes."

De Haan (1920) could not confirm the observation that the micropyle of *Ginkgo* possesses two lips, or three lips if the kernel is destined to become three-sided.

Herzfeld (1927) describes two or three "eigentümliche wellige Flügel-säume", remarkable undulate keels of the nucellus, corresponding to two or three ribs of the stone, suggesting that these keels have something to do with the germination of the seeds.

Above the one-ribbed stone-type has already been mentioned. Very often the sclerotesta has not developed completely, the result being holes or thin patches in this lignified tissue. In some cases the lignification is complete, the stones look perfectly normal, but instead of two or three ribs a single one occur. Probably the shape of the intact seed containing normally build one-ribbed kernels is the same as those containing normally build two- or three-ribbed kernels.

Table V shows the occurrence of the different types of stones in the material investigated. For comparison the values obtained in the Slikkerveer material examined by Affourtit and La Rivière have also been inserted in this table.

TABLE V.
Number of ribs in seed-kernels.

| Origin of the material | Harvested in: | Number of ribs | | | | Total number of seeds |
|------------------------|---------------|----------------|------|-----|---|-----------------------|
| | | 1 | 2 | 3 | 4 | |
| Leyden | 1940 | 92 | 888 | 265 | 1 | 1246 |
| Leyden | 1943 | 29 | 1814 | 630 | 1 | 2474 |
| Slikkerveer | 1914 | — | 47 | 65 | 5 | 117 |
| Slikkerveer | 1943 | 1 | 407 | 148 | 2 | 558 |
| Maastricht | 1943 | 7 | 116 | 35 | 3 | 161 |
| 's Graveland | 1943 | — | 154 | 43 | — | 197 |

Before comparing the different values obtained for the four types of kernels we may draw the attention to the possibility that the material of Slikkerveer 1914 and of 's Graveland 1943 is not wholly reliable. The much deviating values obtained for the Slikkerveer harvest points in this direction. As to the seeds of 's Graveland we have to mention the fact that from this locality the seeds were not received intact, but the kernels only. This suggests the possibility of an unchecked selection.

On considering the data of table V, we notice first of all that the Leyden tree and the tree from Maastricht tend to produce a relatively large number of one-ribbed stones, while the Slikkerveer tree and possibly the tree from 's Graveland too, seldom bear this type. As to the occurrence of four-ribbed kernels, the Leyden tree is very slow in producing this type of stones. Possibly the 's Graveland tree is, in this respect, of the same type. On the other hand, the Slikkerveer and Maastricht ones carry rather often seeds with four-ribbed stones.

As to the proportion between two-ribbed and three-ribbed kernels (cf. *Table VI*) this is about 3. The ratio .72 in the 1914 material of Slikkerveer renders it very probable that the material investigated had been subject to some sort of selection.

TABLE VI.

Proportion between 2- and 3-ribbed stones.

| Origin of the material | Harvested in: | 2-ribbed stones | 3-ribbed stones | Ratio |
|------------------------|------------------|--------------------|--------------------|-------|
| Leyden | 1940 | 888 | 265 | 3.35 |
| Leyden | 1943 | 1814 | 630 | 2.88 |
| Slikkerveer | 1914 | 47 | 65 | .72 |
| Slikkerveer | 1943 | 407 | 148 | 2.75 |
| Maastricht | 1943 | 116 | 35 | 3.31 |
| 's Graveland | 1943 | 154 | 43 | 3.58 |

Affourtit and La Rivière (1915) have drawn attention to the great variability in the ribbing of the seed-stones. As a matter of fact, the angles between the ribs — the stones seen either from the top or from the base — are most variable. In order to investigate whether these are the consequence of some natural law, their angles were measured by means of a simple instrument. In the middle of the base of a graduated arc a movable needle was fixed. By holding a kernel by means of a forceps over the turning point of the needle it was possible to measure the angle between the ribs. The accuracy amounts to about two degrees. *Table VII* shows the number of seeds of which the angle between the ribs has been determined.

TABLE VII.

Number of stones in which the rib-angles were measured.

| Origin of the material | Harvested in: | 2-ribbed stones | 3-ribbed stones |
|------------------------|---------------|-----------------|-----------------|
| Leyden | 1940 | 849 | 217 |
| Leyden | 1943 | 1795 | 606 |
| Slikkerveer | 1943 | 79 | 31 |
| Maastricht | 1943 | 111 | 34 |
| 's Graveland | 1943 | 154 | 43 |

The great difference in the values of the Slikkerveer material in *Tables VI and VII* is caused by the very great number (about 80 %) of very small stones in which it was not possible to measure the angles between the ribs with sufficient accuracy.

First of all we wish to discuss the results obtained for the two-ribbed seeds. The values obtained have been brought to groups of five degrees each (*Table VIII*, page 546; the smaller angles were measured).

From *Table VIII* it appears that not all groups of angles between 1 and 180 degrees are represented in the material investigated. As the variation increases with a larger number of stones, in a still greater material probably all groups will be represented. In any case, however, there is a marked tendency towards an angle of 180°.

This tendency is still more impressively demonstrated when expressed in a graph (*fig. 7*, two harvests of the Leyden tree only). The figures of the classes 1—5 to 121—125 inclusive have been omitted because of the small number of their representatives.

Less simple is the problem how to present the data of the three-ribbed stones in a comprehensible way. To this purpose Bakhuis

Roozeboom's method was chosen, a procedure often used in physico-chemical work and introduced by Baas Beeking for the description of

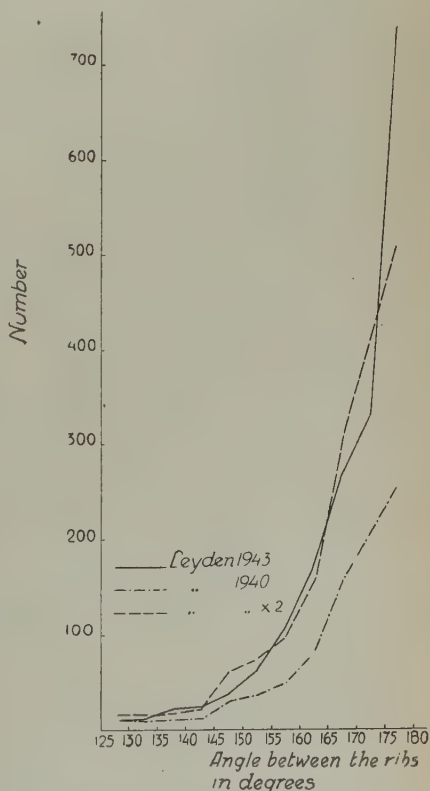


Fig. 7 — Variability in the angles of two-ribbed seed stones.

TABLE VIII.

Angles between ribs of two-ribbed seed-kernels (smallest angles).

| Origin of the material | Harvested in: | 1°-5° | 6°-10° | 11°-15° | 16°-20° | 21°-25° | 26°-30° | 31°-35° | 36°-40° | 41°-45° |
|------------------------|--------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Leyden | 1940 1943 1943 1943 1943 | 1 | | | | | 1 | | | 2 |
| Leyden | | | | | | | | | | |
| Slikerveer | | | | | | | 1 | | | |
| Maastricht | | | | | | | | | | |
| 's Graveland | | | | | | | | | | |
| Origin of the material | Harvested in: | 46°-50° | 51°-55° | 56°-60° | 61°-65° | 66°-70° | 71°-75° | 76°-80° | 81°-85° | 86°-90° |
| Leyden | 1940 1943 1943 1943 1943 | | | | | 1 | | | 1 | 1 |
| Leyden | | | | | | | | | 1 | 3 |
| Slikerveer | | | | | | | | | | |
| Maastricht | | | | | | | | | 2 | 2 |
| 's Graveland | | | | | | | | | | 1 |
| Origin of the material | Harvested in: | 91°-95° | 96°-100° | 101°-105° | 106°-110° | 111°-115° | 116°-120° | 121°-125° | 126°-130° | 131°-135° |
| Leyden | 1940 1943 1943 1943 1943 | 2 1 | 1 | 2 | 3 | 2 | 1 | 1 | 8 | 7 |
| Leyden | | | | | 1 | 1 | 3 | 2 | 8 | 10 |
| Slikerveer | | | | | | | | | | |
| Maastricht | | | | 1 | | 3 | | 1 | 1 | 2 |
| 's Graveland | | | | | | 1 | 2 | 3 | 1 | 1 |
| Origin of the material | Harvested in: | 136°-140° | 141°-145° | 146°-150° | 151°-155° | 156°-160° | 161°-165° | 166°-170° | 171°-175° | 176°-180° |
| Leyden | 1940 1943 1943 1943 1943 | 9 21 | 11 | 29 | 35 | 48 | 80 | 153 | 204 | 255 |
| Leyden | | | 23 | 37 | 62 | 105 | 169 | 265 | 332 | 743 |
| Slikerveer | | | | 2 | 1 | 6 | 8 | 23 | 23 | 15 |
| Maastricht | | | 5 | 7 | 7 | 7 | 3 | 16 | 23 | 30 |
| 's Graveland | | | 2 | 7 | 10 | 6 | 15 | 35 | 31 | 35 |

the environment of organisms in brines and of the composition of natural waters (Boone and Baas Beeking (1931), Massink and Baas Beeking (1934)). As far as we know this method has never been used for the expression of morphological characters.

This method is based upon the fact that in an equilateral triangle the sum of any three lines perpendicular to the sides of the triangle and meeting within it, is constant (cf. fig. 8). The converse of this proposition is, that any point inside an equilateral triangle represents a certain proportion between the three perpendicular lines, connecting it with the sides of the triangle.

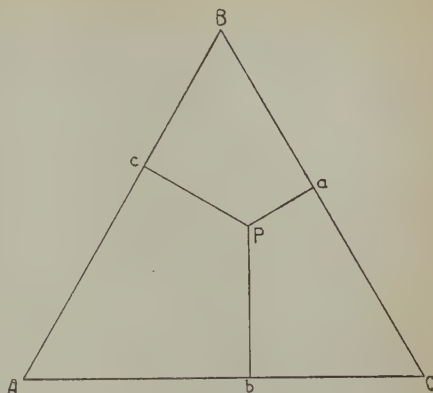


Fig. 8 — Diagram illustrating the principles of Bakhuis Roozebooms' graphic method.

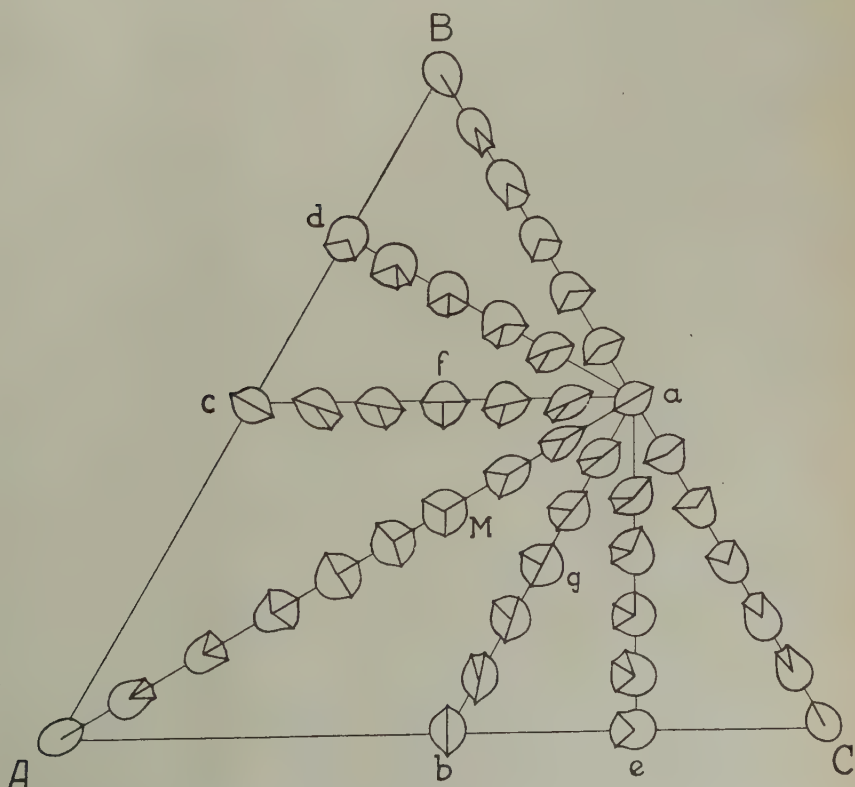


Fig. 9 — Types of seed stones plotted in the triangular diagram.

Let A, B, and C represent certain characters, which may vary from zero to a maximum, in our case angles varying from 0° to 360° . In the case that $A = 360^\circ$, B and C are 0° . A point representing this situation lies in the angular point A. If A is 0° and B and C have a certain value the point representing this situation lies on the line somewhere between the angular points B and C. Generally speaking $A : B : C = Pa : Pb : Pc$.

Fig. 9 elucidates this method relative to our problem. Each schematical drawing of a kernel, as seen from the top, indicates a certain case, a certain proportion between the three angles A, B and C enclosed by the three ribs of the seed. On the sides of the triangle series of points are marked down, where one character is in the minimum, while the two others vary from the minimum to the maximum. If we take side BC of the triangle, all points situated on this line have this in common that the character A is in the minimum, i.e. 0° . Going from B to C the character B decreases, while C increases. This means in our case that on BC stones are placed with one angle (A) of 0° , while the two remaining angles (B and C) may vary from 0° to 360° . Thus, on the sides of the triangle — the angular points excepted — only two-ribbed seed-stones are marked down. In point a B and C are equal, which means that the kernel has two ribs with two angles of 180° .

It is clear that AB, BC, and AC give the same, corresponding points on the three sides, e.g. a, b and c indicate the same type of stone. We have completed our scheme out of one point only viz. point a. Of course the same can be done regarding b or c.

In the middle of the triangle a seed stone M is marked down with three equal angles of 120° . This type lies on the line aA, starting at a with a two-ribbed stone with angle $A = 0$ and the angles B and C of 180° each. A small angle A begins to develop, it grows and grows at the cost of B and C, until it has reached its maximum of 360° .

The lines ac and ab show one angle constant at 180° , in the first case this is angle B, in the second case it is angle C. Here there is a competition between A and C in the first case, A and B in the second case.

Finally there are the lines ad and ae; these show a rather surprising feature. Let us take the line ae. We start in a, angle $A = 0$, B and C are 180° each. Angle A is growing from 0 to 90° , angle B is very quickly decreasing from 180° , while angle C increases from 180 to 270° . At the same time we notice here the splitting of a rib, and the clockwise turning of the two products, and at last the disappearance of one of the components.

It is obvious that $af = bg$, and $cf = ag$. Furthermore ad is the reflected image of ae, which are both again reflected images of the perpendicular lines from b on aC, and from c on aB. Finally $aB = aC$.

After this theoretical introduction we will try to arrange the data, obtained by measuring the three angles A, B and C, in a surveyable way.

It is, perhaps, superfluous to direct the attention to the fact that the naming of the angles is a mere agreement. For it is possible to place a certain type of stone in various points of the triangle. In *fig. 10* four diagrams are given. In these the hatched areas are modifications of one and the same geometrical pattern. In view of *fig. 9* it is comprehensible

that these modifications are not meaningless; *fig. 10* gives in diagram the distribution of the types met with in the Leyden material 1943, arranged in different ways. It seems to us that *fig. 10* n. 4, by its more diffuse composition represents the arrangement in the most surveyable way, since the cases are mostly dispersed along the lines a A and a b.

In *figs 11 A–F* the two- and three-ribbed kernels, mentioned in Table VII, are arranged according to the method discussed above. Of

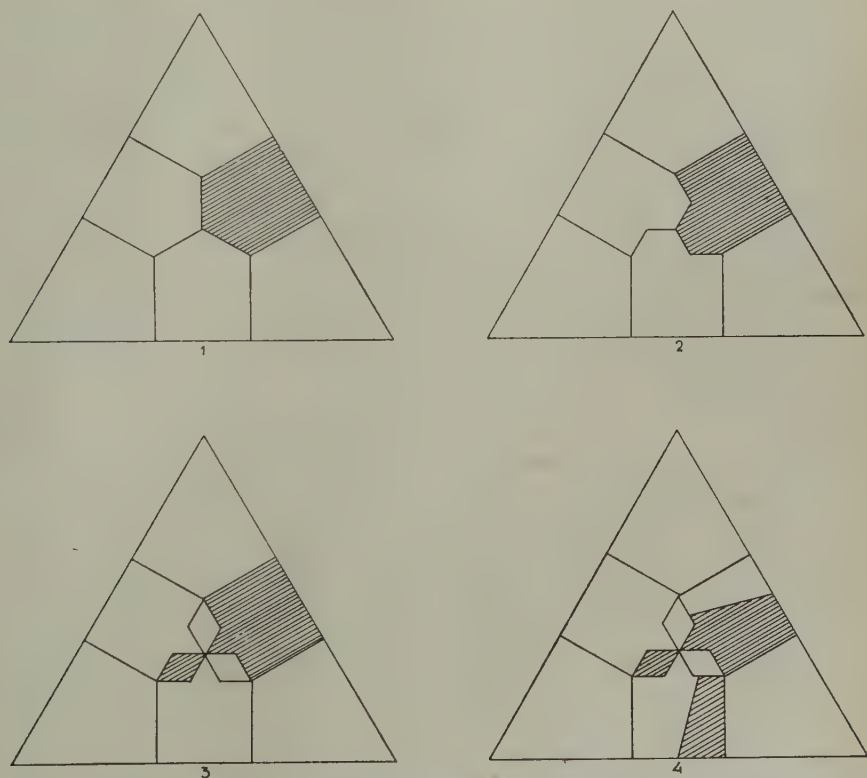


Fig. 10 — Four different diagrams so as to illustrate the possible arrangement of three-ribbed seed stones. Explanation in the text.

these the *figs 11 A, B* and *C* are the most important ones, because of the great number of measured kernels. Concerning them there are several points worth mentioning. With the exception of two points in the Leyden material, those nearest point A (*fig. 11 A*), all figures show the same feature. It is remarkable that no stones have been found along the line a A with angle A greater than 180° . In the neighbourhood of the angular points no seed stones occur, except the one-ribbed stones in the angular points and the two-ribbed ones along the sides of the triangle. Along the line a b the distribution is rather equal. Between a g and a M (cf. *fig. 9*) a great many dots are situated. The number of transitions

between the types situated on these lines is very great; their distribution is rather equal. It is astonishing, however, that there are some very densely dotted areas, whereas some others show hardly any dots at all. Possibly this is due to an insufficient number of kernels.

In *fig. 11 B* the line of dots starting from *b* obliquely upwards to the right (reflected image of the line *a e* of *fig. 9*) is rather interesting. As a matter of fact this line of dots had been obtained before arrangement of types on the line *a e* of *fig. 9* was recognized.

Furthermore there is a transition between stones with three distinct ribs and two-ribbed kernels. The closer to *a* the dots are situated, the smaller becomes angle *A*. The dots closest to *a* represent seeds stones with an *A* angle of some degrees only, while the angles *B* and *C* are nearly 180° . The various types of two-ribbed stones have been marked down upon the line *a B*, only in order to show the variation; the number could not be expressed here.

Although the diagrams seem exaggerated in this respect, it is clear that the state of radial symmetry is difficult to attain.

We have taken two concentric areas around the centre *M*, one area representing kernels with angles varying from 108° to 132° , the other for stones with angles varying between 114° and 126° . From *Table IX* it may be taken that the number of more or less radially symmetrical stones is very small indeed.

TABEL IX.

Numbers of three-ribbed kernels with angles of 108° — 132°
and of 114° — 126° respectively.

| Origin of the material | Harvested in: | Total number of 3-ribbed stones | 3-ribbed stones angles 108° — 132° | 3-ribbed stones angles 114° — 126° |
|------------------------|------------------|--|---|---|
| Leyden | 1940 | 217 | 3 | 2 |
| Leyden | 1943 | 606 | 24 | 3 |
| Slikkerveer | 1943 | 31 | 2 | 1 |
| Maastricht | 1943 | 34 | 2 | — |
| 's Graveland | 1943 | 43 | — | — |

In the Chinese literature the view is expressed that the two- and three-ribbed stones of Ginkgo should give rise to trees of different sex. This would be very convenient, for instance for growing Ginkgo trees from seed with the purpose to use them for street-plantation (male trees are preferred, cf. Pulle 1943). It seems to us, however, that in view of the number of transitions between typical two- and three-ribbed stones, such a difference is hardly possible.

The fact that a certain aversion may be stated against a radial

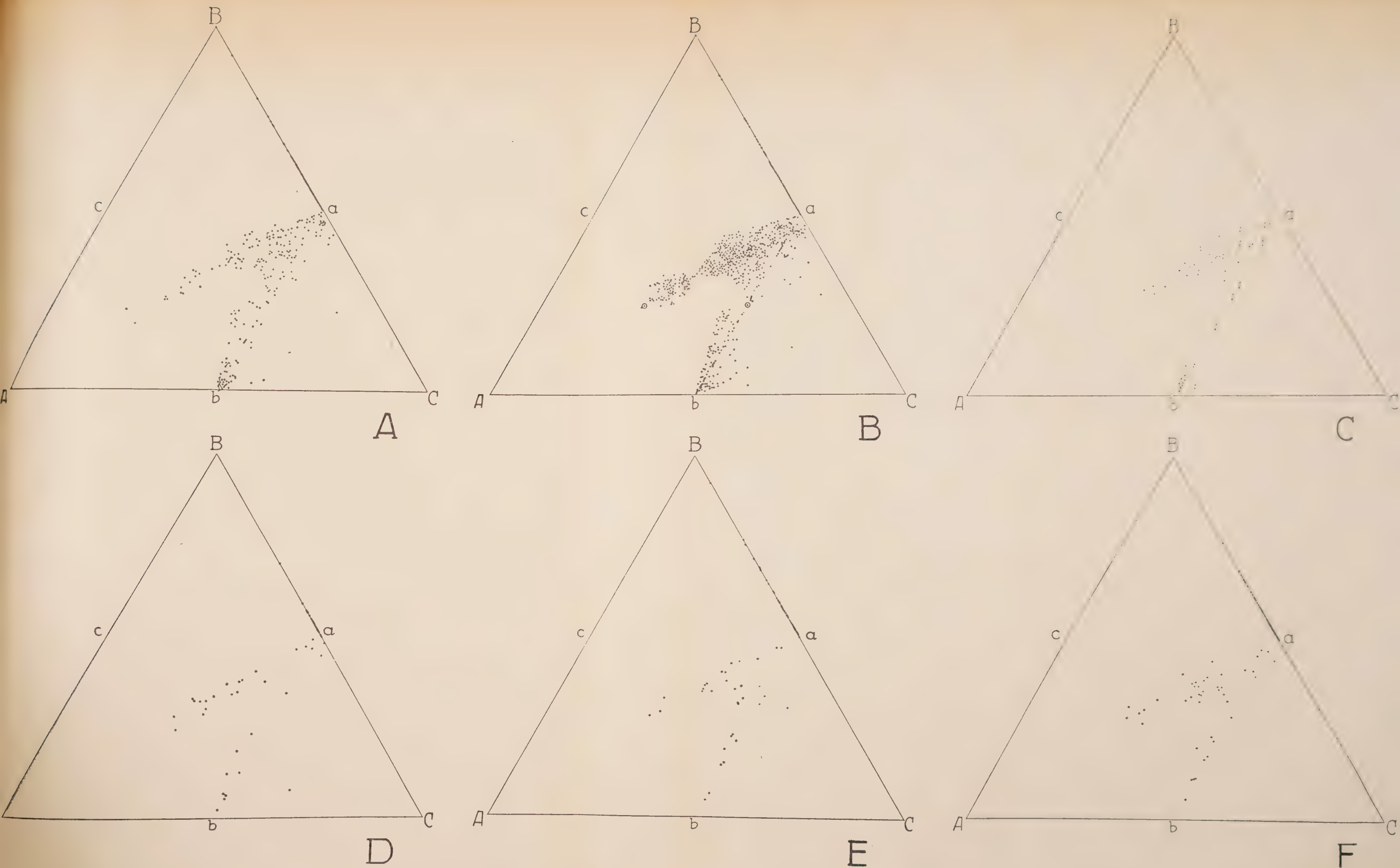


Fig. 11 — Diagrams showing the graphic position of three-ribbed seed stones. The dots along the line aB represent two-ribbed stones.

- A. Leyden 1940. $\bar{\cdot}$ dots for two identical kernels.
- B. Leyden 1943. \odot represent the same seed stone.
- C. All dots represent identical kernels of diagram B. \cdot dots for two identical kernels, $\bar{\cdot}$ dots for three identical kernels, $\underline{\cdot}$ dots for four identical kernels.
- D. Slikkerveer 1943.
- E. Maastricht 1943.
- F. 's Graveland 1943.

symmetry of three-ribbed stones may be important regarding the opinion on the possibility of three-ribbed stones being primitive.

Salisbury (1914) writes the following sentences in relation to radio-spermy and platyspermy: "Our knowledge of the structure of Conostoma and Gnetopsis has shown how narrow is the dividing line between radio-spermy and platyspermy. Also the recent discoveries of Aneimitis fertilis and Pecopteris Plukenetii, together with the obvious relationships between Pteridosperms and the Cordaiteae, render it necessary to consider the possibility of deriving bilateral form from a trigonous group..... To come much nearer, the fructifications of Ginkgo biloba have been found with three ribs in place of two, a variation that may even be a reversion."

In 1916 the same author gives a short addition to the above-mentioned publication in connection with the paper of Affourtit and La Rivière: "In the taxonomically more important features of general organization the ovules of Ginkgoales, Cycadales and Trigonocarpaceae exhibit a uniformity of construction difficult to explain except on the basis of affinity..... On such a view, the large proportion of Ginkgo ovules with three ribs recorded by Affourtit and La Rivière has an added significance."

In 1920 De Haan again adds some points to support this view: "Salisbury has already published about the relation between Ginkgo and Trigonocarpus. Here I may add a point of apparent resemblance, which Salisbury did not notice, viz. the clearly visible sutures at the places of the ribs in the apical region in a young stage of development of the ovule of Ginkgo. These sutures support the view of possible connection between the seeds of Ginkgo and Trigonocarpus, which had been supported by the great frequentation of three- angular seeds, investigated by Affourtit and La Rivière."

The regrettable selection of Ginkgo seeds, which were the object of the investigation of Affourtit and La Rivière, has given an unauthorized support to the views of Salisbury and De Haan.

The results, mentioned in *Table IX*, lend, in the trend of thought of Salisbury, sufficient support to the opinion that the regularly three-ribbed stone of Ginkgo is certainly not the more primitive form.

There remains, however, another possibility. Van Heurn and Lam (1937) investigated the occurrence of pleiomery and meiomery in the fruits of two *Canarium* species. These phenomena are, according to them, "to be considered as what Eichler called an 'originäre Variabilität', a variability inherent to the species. Yet this variability may have a certain phylogenetic significance; both the amplitude and the frequency are reflecting the degree of fixation of the equilibrium ('normal') stage and prevalence of one side of the variation over the other may indicate whether or not the 'average' has, phylogenetically speaking, already passed the fixed stage."

In the case of the investigated *Canarium* species a number of phases of regression were established, considering meiomery as a future phenomenon, pleiomery as an atavistic one. It appeared that the species in question show different phases of regression.

This might be true for Ginkgo too. As it is very difficult to decide from the data obtained from one species only how the more primitive form

looked like and till now nothing is known about the relatives of Ginkgo, it is, at present, not allowed to propose even a suggestion.

Summary.

From a number of Ginkgo trees kernels were examined. The investigation of the variability of the material was greatly favoured by the large number of stones, in total about 4700. In addition, one tree, grown in the Botanic Garden at Leyden, supplied the material for an investigation of the variability of the female "flowers", in total about 1700.

1. The number of female "flowers" or rather macrosporangiophores on the brachyblasts (short shoots) proved to be most variable, showing a correlation with the age of the shoot (*Table I, fig. 1*).

2. A subdivision of the macrosporangiophores into a series of types proved to be possible (*Table II, fig. 2-3*).

3. A certain relation between the shape of the macrosporangiophore and the shape of the leafy organs from whose axil it arises, was stated. Here again the age of the brachyblasts plays a part. It should be emphasized that the term "abnormality" is misleading. A great number of so-called abnormalities in the macrosporangiophores of Ginkgo prove to form part of a normal series of gradating variations (*Table III, fig. 4*).

4. There proved to be a relation between the shape of the seed and the shape of the kernels (*fig. 5*). Oblong seeds give long, pointed stones, while pear-shaped seeds contain club-shaped kernels. Furthermore very small seeds with normally shaped, but very small stones were found. Finally seeds are found in which the pollen-chamber is situated laterally instead of apically. In these seeds the stone is abnormal in shape, its sclerotesta mostly being incompletely lignified.

5. A further point of investigation was the length of the seed stalk (*Table IV, fig. 6*). This shows a considerable variation, the Leyden material possessing very short seeds stalks, while the Maastricht material had intermediate, that from Slikkerveer long stalks.

6. Finally the variation of the shape of the kernel was investigated. First of all a subdivision into stones with 1, 2, 3 or 4 ribs was made (*Table V*). The Leyden tree produced relatively many stones of the first group, but four-ribbed kernels are very rare, two- and three-ribbed ones being in the majority. The ratio two-ribbed stones: three-ribbed stones proved to be ± 3 (*Table VI*). It is probable that the material of Affourtit and La Rivière has been subject to some sort of selection, on account of which their results are not fully trustworthy.

7. There proved to be a strong variation in the angles between the ribs in two- and three-ribbed seed stones (*Tables VII and VIII*). In the two-ribbed kernels a tendency towards angles of 180° was stated (*fig. 7*), the most frequent shape being that of the kernel of a prune.

8. The graphic expression of the variability of three-ribbed stones presented some difficulties. To their solution Bakhuis Roozeboom's tri-angle-method was chosen (*figs 8-11*). The most important result is the

extreme rarity of regular seedstones with three angles of about 120° (Table IX).

9. It is certainly very remarkable that so ancient a plant as *Ginkgo biloba* shows such a variability in so many respects.

Literature.

- AFFOURTIT, M. F. A. and H. C. C. LA RIVIÈRE, On the ribbing of the seeds of *Ginkgo*. — *Ann. of Bot.* 29, 1915, 591—595.
- BOONE, E. and L. G. M. BAAS BECKING, Salt effects on eggs and nauplii of *Artemia salina* L. — *J. gen. Phys.* 14, 1931, 753—763.
- CAROTHERS, I. E., Development of ovule and female gametophyte in *Ginkgo biloba*. — *Bot. Gaz.* 43, 1907, 116—130.
- ČELAKOVSKÝ, L. J., Die Vermehrung der Sporangien von *Ginkgo biloba* L. — *Oesterr. bot. Zeitschr.* 50, 1900, 229—236, 276—283, 337—341.
- HAAN, H. R. M. DE, Contribution to the knowledge of the morphological value and the phylogeny of the ovule and its integuments — Thesis Groningen 1920.
- HEURN, W. C. VAN and H. J. LAM, On fertility, pleiomery and meiomery in the fruits of some *Canarium* species — *Blumea Supplem.* I, 1937, 97—106.
- MASSINK, A. and L. G. M. BAAS BECKING, On the changes in the composition of natural waters (with reference to the "IJsselmeer") — *Rec. Trav. chim. Pays Bas* 53, 1934, 1047—1060.
- PILGER, R., *Ginkgoales* in Engler-Prantl, *Die natürlichen Pflanzenfamilien*, 2. Aufl. Leipzig 1926.
- , *Coniferae* in Engler-Prantl, *Die natürlichen Pflanzenfamilien*, 2. Aufl. Leipzig 1926.
- PULLE, A., Over de *Ginkgo*, alias *Ginkyo* — *Jaarboek Ned. Dendrol. Ver.* 1943 (in the press).
- SAKISAKA, M., On the seed-bearing leaves of *Ginkgo* — *Jap. J. of Bot.* 4, 1929, 219—235.
- SALISBURY, E. J., On the structure and relationships of *Trigonocarpus Shorensis*, sp. nov. — *Ann. of Bot.* 28, 1914, 39—80.
- , On the relation between *Trigonocarpus* and *Ginkgo* — *Ann. of Bot.* 30, 1916, 356.
- SCHAFFNER, J., *Ginkgo* a flowerless seed plant — *Amer. J. of Bot.* 14, 1927, 126—128.
- SEWARD, A. C. and J. GOWAN, The Maidenhair tree (*Ginkgo biloba* L.) — *Ann. of Bot.* 14, 1900, 109—154.
- SPIESS, K. VON, *Ginkgo*, *Cephalotaxus* und die *Taxaceen* — *Oesterr. bot. Zeitschr.* 52, 1902, 432—436, 469—473 and 53, 1903, 1—9.
- SPRECHER, A., *Le Ginkgo biloba* L. — Thesis Geneva 1907.
- STRASBURGER, E., *Die Angiospermen und die Gymnospermen*. Fischer, Jena 1879.
- WETTSTEIN, R. VON, Die weibliche Blüte von *Ginkgo* — *Oesterr. bot. Zeitschr.* 49, 1899, 417—425.
- WORDSWORTH, W. C., The origin and meaning of medullary (intraxylary) phloem in the stems of Dicotyledons — *Ann. of Bot.* 29, 1915, 567—590.
- , The principles of plant-teratology — 2 vols. Ray Society London, 1915—1916.
- ZIMMERMANN, W., *Die Phylogenie der Pflanzen*. Fischer, Jena 1930.

CONTRIBUTIONS TO OUR KNOWLEDGE OF THE FLORA OF CELEBES (COLL. C. MONOD DE FROIDEVILLE) AND OF SOME OTHER MALAYSIAN ISLANDS

by

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(Issued December 31st, 1945).

The following notes are mainly based upon a small but interesting collection of plants, made in 1937—1939 by Mr C. Monod de Froideville, Civil Service Officer in the Netherlands Indies, during his extensive trips in the southern and central parts of the island of Celebes. His hobby was the study of *Leguminosae* and about half of his collection consists of representatives of that natural order. For several reasons, however, they have been left out of the present paper, for one thing since Mr Monod is intending to deal with them later on himself, a task, which circumstances unfortunately prevent him from accomplishing at present; and secondly since they promise geographically less important results than most other families, many of them being anthropochorous.

However, beside *Leguminosae*, Mr Monod collected a good many other plants and though some of his material was necessarily scanty on account of the fact that the proper purpose of his trips lay outside purely botanical observations, it contains enough remarkable specimens, especially from the practically unknown interior of Central Celebes (Mt. Mamboeliling), to justify a record of them. Mr Monod has proved to be a keen observer and a thorough amateur botanist and geologist. Several of the specimens had been provisorily checked by Dr C. G. G. J. van Steenis, Buitenzorg, which was a great help in their final identification. Regarding this, it was my good fortune to win the help of several specialists in identifying specimens belonging to families falling within the scope of their special study. Thus I am indebted to the following investigators for their kind collaboration:

Miss Dr G. J. H. Amshoff (Utrecht): *Urticaceae*.

Dr R. C. Bakhuizen van den Brink (Leiden): *Melastomataceae*.

Dr C. E. B. Bremekamp (Bilthoven): *Acanthaceae*, *Rubiaceae*.

Dr J. Th. Henrard (Leiden): *Gramineae*.

Dr F. P. Jonker (Utrecht): *Burmanniaceae*.

Miss Dr J. Th. Koster (Leiden): *Compositae*.

Dr S. J. van Ooststroom (Leiden): *Convolvulaceae*, *Violaceae*.

Dr J. J. Smith (Oegstgeest): *Orchidaceae*.

Dr H. Uittien † (Deventer): *Cyperaceae*.

The representatives of the other families were investigated by myself. For the *Pteridophyta* I enjoyed the assistance of Mr C. J. Verhey (Leiden).

It should be emphasized that the present elaboration has been mainly restricted to those specimens which could be identified down to the species or which are of special geographical interest. Description of new species has, in general, been omitted in families for which a specialist was wanting or unapproachable, and in cases of too scanty material. The few exceptions are species which could comparatively safely be checked. This procedure was also necessary because of the interrupted contact with the Buitenzorg Herbarium (B), which possesses duplicates of most of the specimens. Meanwhile, it may be expected that the collection contains several other new species, e.g. of *Alpinia*, *Dichrotrichum*, *Galium*, *Impatiens*, *Justicia*, *Thyrsostachys*, *Vaccinium* and possibly some others.

The arrangement within the main groups is alphabetical throughout. The distribution has been taken from literature — first of all Merrill's Enumeration of Philippine Flowering Plants 1923—1926 — as well as from the collections extant in the Rijksherbarium.

PTERIDOPHYTA

(with the collaboration of C. J. Verhey)

Lycopodiinae

LYCOPODIACEAE

1. *Lycopodium casuarinoides* Spring, Monogr. Lycop. I, 1842, 94; Nessel, Die Bärlappgewächse, 1939, 371.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, 1500 m, frequent in open secondary forest (*C. Monod de Froideville* 277, climbing, about 3 m high, ster.; B, L); Celebes, without locality (*Id.* 270; L).

Nessel (l. c., p. 372) mentions a var. *penicilliferum* v. A. v. R. from Celebes and Sumatra, which should be distinguished by long ciliate leaf-tips. However, it seems to me that this is largely a matter of age. I found these membranous, hyaline and often ciliate leaf-tips in all specimens extant in the Rijksherbarium, but they seem to fall off with age.

Distribution of the species: Bengal to China, Philippines, Brit. Malaya, Sumatra, Borneo, New Guinea. According to Monod abundant in the C. Celebes mountains. The habitats Malaya and New Guinea are not mentioned by Nessel.

2. *L. cernuum* L., Sp. Pl. 1753, 1103; Nessel l. c. 351.

Celebes: without exact locality, frequent (*C. Monod de Froideville* 371; L).

Distribution: pantropic.

Var. *curvatum* Sw., Syn. Fil. 1802, 178 and 402; Nessel, l. c. 354.

Celebes: S.E. Celebes, Kendari, on sunny wall of cutting of road to waterworks (*C. Monod de Froideville* 372a; L).

Distribution of the variety: several places in the tropics.

3. *L. clavatum* L., Sp. Pl. 1753, 1100.

Var. *tamariscispica* Cesati, Rendic. Ass. Sc. Fis. e Mat. Napoli II, 1877, 6 and 8; Nessel, l. c. 294.

Celebes: S.E. Celebes, Kendari, on sunny wall of cutting of road to waterworks, about 150 m alt. (*C. Monod de Froideville 372*; L).

Distribution of the species: tropics, subtropics and holarectic; of the variety: New Guinea; new for Celebes.

4. **L. complanatum** L., Sp. Pl., 1753, 1101; Nessel, l.c. 328.

Celebes: without exact locality (*C. Monod de Froideville 369*; L).

Distribution: cosmopolitic.

5. **L. volubile** Forst., Prodr. Fl. Ins. Austr. 1786, 482; Nessel, l.c. 369.

Celebes: without exact locality (*C. Monod de Froideville 374*, A° 1939; L).

Distribution: Polynesia and Australia to Philippines and Sumatra.

SELAGINELLACEAE

6. **S. elegantissima** Warb., Monsunia I, 1900, 128; Hieron. in Engl. & Prantl, Nat. Pfl.fam. I⁴, 1902, 698, fig. 406.

Celebes: S.W. Celebes, along road from Soengoeminasa to Malino, about 600 m, on bank of rivulet (*C. Monod de Froideville 390*, A° 1939; L); Malino, about 280 m alt. (*H. A. B. Bünne Meyer 10852*, 6. 4. 1921; B, L).

We did not see the type specimen but the specimens quoted agree perfectly both with the description and with Hieronymus' pictures. Its relation is with *S. Teysmanni* Hieron. (S.W. Celebes; Luzon: *Elmer 8500*, type of *S. Hombroni* Hieron.) with which it is, in my opinion, not conspecific, differing by its more erect and stiffer habit and by its ciliate sporophylls. It is, however, very close to *S. Zollingeriana* Spring from eastern Java, from which it seems to differ only in the stouter habit. Further allies are such species as *S. leptophylla* Bak. (Formosa); *S. ketrayam* v. A. v. R. (Bangka) and *S. lepida* Hieron. (Borneo), all of which seem to differ as to minor points only. The macrospores are light sulphur-yellow, the microspores minium red in colour.

Distribution: thusfar only known from S.W. Celebes (Maros, Malino).

7. **Selaginella opaca** Warb., Monsunia I, 1900, 108 and 122; Alston, Bull. Jard. bot. Buit. Sér. III, Vol. XIII, 1935, 437 and XIV, 1937, 183.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, in subalpine elfin woodland, 2700 m (*C. Monod de Froideville 135*, A° 1938; B, L).

Distribution: Sumatra to Philippines and New Guinea.

8. **S. plana** (Desv.) Hieron. in Engl. & Prantl, Nat. Pfl. Fam. I⁴, 1901, 703; Alston, l.c. 1935, 436 and 1937, 180.

Celebes: without exact locality, frequent in shady places with much humus (*C. Monod de Froideville 275* and *379*; L).

Distribution: Brit. Malaya to Moluccas.

9. **S. singalanensis** Hieron., Hedwigia 50, 1910, 18; Alston, l.c. 1937, 184.

Celebes: S.W. Celebes, Bisapoe nr Bonthain, near waterfall, in moist shady place (*C. Monod de Froideville 392*, A° 1939; L).

Distribution: Sumatra, E. Java ?!, S.W. Celebes.

A small, sterile specimen, but most probably this species.

Filicinae

CERATOPTERIDACEAE

10. **Ceratopteris thalictroides** (L.) Brongn., Bull. Soc. Philom. 1821, 186c.

Celebes: S.W. Celebes, Bone, Soppeng, nr Tjitta, about 300 m alt., in pond, submerge, frequent (*C. Monod de Froideville* 391, A° 1939; L).

Distribution: pantropical and subtropical.

GLEICHENIACEAE

11. **Gleichenia linearis** (Burm.) Clarke, Transact. Linn. Soc. II, Bot. 1, 1880, 428.

Celebes: frequent in sunny open vegetations on poor soil (*C. Monod de Froideville* 278, A° 1938; B, L).

Agrees with a specimen from Mindanao (*Elmer* 14142), identified var. *lanigera* (Don) teste Rosenstock in Herb. Lugd.-Bat. (= *G. lanigera* Don, Prodr. Fl. Nep. 1825, 17).

Distribution: pantropical and subtropical.

HYMENOPHYLLACEAE

12. **Hymenophyllum denticulatum** Sw., Schrad. Journ. 1800², 1801, 100.

Celebes: Central Celebes, Mt. Rante Karoea, north of Makale, 2000 m, in forest (*C. Monod de Froideville* 177, A° 1938; B, L).

Distribution: India to Philippines and New Guinea.

MARSILEACEAE

13. **Marsilea crenata** Presl, Rel. Haenk. 1, 1825, 84, t. 12, f. 13; Backer en Posthumus, Varenflora voor Java 1939, 264.

Celebes: S.W. Celebes, nr Bonthain, on wet paddy field, frequent, alt. \pm 10 m (*C. Monod de Froideville* 377, A° 1939; L).

Distribution: India to Philippines and New Guinea.

POLYPODIACEAE

14. **Asplenium praemorsum** Sw., Prodr. 1788, 130.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, 2900 m, on rocky open summit (*C. Monod de Froideville* 237; B, L).

Distribution: pantropical and subtropical.

15. **Asplenium Psychropolitanum** H. J. Lam et C. J. Verhey, nov. spec. — *Fig. 1* — Rhizoma ?; Stipes ?; Frons minime 30 cm longa, 4 cm lata, rhachide 0.75—1 mm crassa, in sicco fusco-atra, opaca, tereti vel paulo sulcato-angulata, glabra vel paulo pilosa, simpliciter pinnata, in nodis saepe vivipara. Pinnae glabrae, utrinque minime 35, apicalibus 10—15 exceptis omnes aequilongae, oblongo-lanceolatae c. 20 mm longae,

basi usque ad 5 mm latae, parte basali latiore sterili 0.5—0.7 cm



Fig. 1 — *Asplenium Psychropolitanum* H. J. Lam et C. J. Verhey, n. sp. — a. part of frond with one young plant, nat. size; b. pinna, lower side, $\times 2$ — after type specimen.

longa, latere basiscopo usque ad costam oblitterata, acrosco-po margine obtuse irregula-riter denticulata, paucis nervis divergentibus percurta, parte apicali angustiore fertili linea-ri-acuminata 1.3—1.5 cm longa, utrinque c. 3 dentibus erecto-patentibus praedita, soris 1—6 (vel plus ?), 0.2—0.5 cm longis, indusiis lato-linearibus, costam versus apertis, costa media subparallelis.

Celebes: Central Celebes, Mt. Rante Karoea, north of Ma-kale, about 2000 m alt., in mountain forest (C. Monod de Froideville 179; type specimen; L).

Apparently related to *A. caudatum* Forst. (pantropical) and to *A. acutiusculum* Bl. (Sumatra to Philippines and

Samoa) but easily distinguishable by the smaller and narrower pinnae with fewer sori, the sterile basal part of which occupies about one third of their length, being quite distinct from the narrow fertile portion. The specimen consists of a portion of a leaf only but it is probable that only few pinnae, if any, are missing.

16. *Calymmodon cucullatus* (Nees et Bl.) Presl, Tent. Pterid. 1836, 204; Copeland, Phil. Journ. Sci. 34, 1927, 261; Backer en Posthumus, Varenflora voor Java 1939, 224 — *Polypodium cucullatum* Nees et Bl., Nova Acta 11, 1823, 121.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, 2700 m (C. Monod de Froideville 132 and 133, A° 1938; B, L).

Distribution: Ceylon to W. Polynesia.

17. *Dipteris novo-guineensis* Posth., Rec. Trav. bot. néerl. XXVa, 1928, 248, fig. 1.

New Guinea: Central New Guinea, Mt. Doorman, 3260 m, open summit (H. J. Lam 1750, 24-10-1920; type specimen; B); Papua, Soridi, open hill top c. 6000 ft. (C. E. Carr 14415, 5-10-1935; L).

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, 2700 m, frequent in subalpine elfin forest (C. Monod de Froideville 130, A° 1938; B, L).

The Celebes specimen is very similar to that collected by Lam in New Guinea. According to Monod, the leaves are still young, adult leaves being 0.50 m long, their height being 1 m, the stipe inclusive. When dry the colour of the lower side of the leaf is whitish, but the nerves are rusty woolly. Carr's specimen (identified by Posthumus) bears the annotation: "fern c. 2 feet tall"; the leaf is about 13 cm long, the stipe 60 cm, the lower side of the leaf is densely rusty woolly, the upper side only so on the nerves. The identification of the

last-named specimen seems a little doubtful; all specimens are sterile.

This is a most remarkable find, the Celebes specimen being the first record outside New Guinea. It confirms the often stipulated connection of Central Celebes and New Guinea. The species is interesting because it seems to be related to the fossil genus *Hausmannia*, found in the Cretaceous, Lias and Rhät of Europe, and particularly so with *H. crenata* (Nath.) Richt. from the Rhät of Sweden. Posthumus even asserts that the present species seems more closely allied to the fossil forms quoted than to the living *Dipteris* species, but in view of Carr's specimen, which seems to tend to *D. conjugata* Reinw., this seems at least doubtful. Posthumus's suggestion to include the present species in the genus *Hausmannia* should therefore, we think, not be followed.

Distribution: New Guinea, C. Celebes.

18. *Drynaria rigidula* (Sw.) Bedd., Schrad. Journ. 1800², 1801, 26.

Celebes: S.W. Celebes, Loka-Bonthain trail, about 600 m alt., epiphytic (C. Monod de Froideville 365, A° 1939; L).

Distribution: Asia to Australia and Polynesia.

19. *Elaphoglossum pumilum* H. J. Lam et C. J. Verhey, nov. spec. —

Fig. 2 — Rhizoma 0.1—0.15 cm crassum, paleis membranaceis brunneis 0.2—0.25 cm longis triangularibus acutis tecta. Folia haud articulata, sterile (unum tantum videmus) ovatum rigidum, basi latum subabrupte in stipitem contractum, apice obtusum, marginibus subcartilagineum in siccis paulo revolutum, 1.6 × 0.9 cm, stipes gracilis 2 cm longus; fertile (unum videmus) paulo longius, oblongum 1.7 × 0.85 cm, stipite 4.3 cm longo, subtus costa media excepta omnino sporangiis dense tectum, nervis inconspicuis, stipitibus glabris vel paucis paleis minutis praeditis.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, about 2500 m, in mountain forest (C. Monod de Froideville 253, type specimen L, June 5—6, 1938; B, L).

A characteristic species distinguished by its exceptionally small leaves, possibly allied to *E. dolichaulon* v. A. v. R. (Bull. Jard. bot. Buitenz. Sér. III, Vol. V, 1922, 203) from East Java.

20. *Hymenolepis revoluta* Bl., Enum. 1827, 201.

Celebes: S.W. Celebes, Loka-Bonthain trail, about 600 m alt., epiphytic (C. Monod de Froideville 376; L).

Formerly confused with *H. spicata* (L.) Presl (Africa, Madagascar), cf. Backer en Posthumus, Varenflora voor Java, 1939, 228, note 1.



Fig. 2 — *Elaphoglossum pumilum*
H. J. Lam et C. J. Verhey, n. sp.,
nat. size — after type specimen.

Distribution: Sumatra to Philippines and New Guinea.

21. *Polypodium cryptosorum* C. Chr., Ind. Fil. 1906, 520.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, open summit, 2900 m (C. Monod de Froideville 225, June 5—6, 1938; B, L).

Distribution: Java, Borneo, Celebes.

22. *P. enerve* Cavan., Descr. 1802, 245.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, in subalpine elfin forest, 2700 m (C. Monod de Froideville 137, fert., A° 1938; B, L).

See annotation under *P. triquetrum*.

Distribution: Malaysia to Marianas.

23. *P. taeniatum* Sw., Schrad. Journ. 1800², 1801, 26; Backer en Posthumus, Varenflora voor Java, 1939, 221.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, subalpine elfin forest, 2700 m (C. Monod de Froideville 138, A° 1938; B, L).

Distribution: Sumatra, Borneo, Java, Celebes, Moluccas.

24. *P. triquetrum* Bl., Enum. 1828, 124.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, in subalpine elfin forest, 2700 m (C. Monod de Froideville 136, ster., A° 1938; B, L).

Very close to *P. enerve*, in fact only distinguishable by the broader, not caudate paleae on the rhizome. Probably only a variety of that species (f. Backer en Posthumus, Varenflora voor Java, 1939, 200—201).

Distribution: Sumatra to Samoa.

25. *Stenosemia aurita* (Sw.) Presl, Tent. 237, 1836, t. 10, f. 24.

Celebes: S.W. Celebes, Bisapoe Waterfall nr. Bonthain, about 200 m alt., in forest, some specimens (C. Monod de Froideville 385; L).

Distribution: Sumatra to Solomons.

26. *Vaginularia paradoxa* Mett., Ann. Mus. Lugd. Bat. 4, 1868—1869, 174.

Celebes: without indication of exact locality (C. Monod de Froideville 394, A° 1939; L).

Distribution: Ceylon to Melanesia.

27. *Vittaria angustifolia* Bl., Enum. 1828, 199.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, in mountain forest 2500 m (C. Monod de Froideville 224, June 5—6, 1938; B, L).

Distribution: Sumatra, Java, Bali, Celebes.

28. *V. parvula* Bory, Bél. Voy. Bot. 2, 1833, 35.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, in mountain forest, about 2500 m (C. Monod de Froideville 167; B, L).

Possibly conspecific with the preceding species (f. Backer en Posthumus, Varenflora voor Java, 1939, 185).

Distribution: Java, Sumatra, Borneo, Celebes.

SCHIZAEACEAE

29. *Lygodium japonicum* (Thunb.) Sw., Schrad. Journ. 1800², 1801, 106.

Celebes: S.E. Celebes, Moena, savannah (C. Monod de Froideville 400, A° 1938; L).

Distribution: India to Japan and tropical Australia.

GYMNOSPERMAE

Coniferae

ARAUCARIACEAE

30. **Agathis philippinensis** Warb., *Monsunia* I, 1900, 185.

Celebes: Central Celebes, Mamasa, 1000 m alt. (*C. Monod de Froideville* 260, ster., cultivated; L).

Distribution: C. and N. Celebes, Philippines.

According to Monod this species is abundant in the higher mountains of central Celebes; it is a producer of gum copal.

PODOCARPACEAE

31. **Podocarpus imbricata** Bl., *Enum. pl. Jav.* I, 1827, 89; Wasseher in *Blumea* IV, 1941, 388.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, about 2000 m, rather frequent in mountain forest (*C. Monod de Froideville* 173, A° 1938, ster.; B, L).

Distribution: Burma and China to W. Polynesia.

32. **P. Pilgeri** Foxw., *Phil. Journ. Sci.* 2, 1907, Bot. 259; Wasseher, l. c. 463.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, 2700 m, sub-alpine bush (*C. Monod de Froideville* 175, small tree or shrub, ster.; B, L).

Distribution: Philippines and Celebes to the Solomon Islands.

ANGIOSPERMAE

Monocotyledoneae

AMARYLLIDACEAE

33. **Curculigo orchiodes** Gaertn., *De Fruct. et Sem.* I, 1788, 63, t. 16.

Celebes: S.W. Celebes, Senkang, in the "Tempe depression", about 50 m alt., pretty frequent in grass vegetation (*C. Monod de Froideville* 288, flow. bright yellow; B, L).

Distribution: India to W. Polynesia.

BURMANNIACEAE

(F. P. Jonker)

34. **Burmannia disticha** L., *Sp. Pl.* 1753, 287; Jonker, *Monogr. Burm.* 1938, 115.

Celebes: Central Celebes, Mamasa, 1000 m alt., fairly abundant in grass vegetation (*C. Monod de Froideville* 264, flow. lilac with yellow; B, L).

According to Monod the species is also found nr. Balokan, Makale, at an alt. of 1500 m.

Distribution: tropical and subtropical Asia to Australia, not in the Philippines. In the Netherlands Indies thusfar only known from Sumatra, Borneo, N. and C. Celebes, and New Guinea.

CYPERACEAE

(H. Uittien †)

35. *Cyperus cuspidatus* H. B. K., Nov. Gen. Sp. Pl. I, 1815, 204.

Celebes: S.W. Celebes, Bone, Oedjoeng Lamoeroe, about 200 m alt., frequent on cattle grounds (*C. Monod de Froideville* 378, A° 1939; L).

Distribution: pantropic.

GRAMINEAE

(J. Th. Henrard)

36. *Thyrsostachys* prob. nov. spec. — Fig. 3.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, about 2000 m, in mountain forest (*C. Monod de Froideville* 168, A° 1938, ster.; B, L).

A small and graceful mountain bamboo, according to Monod forming a pretty dense undergrowth in a forest of mossy trees and *Pandani*. Whilst the generic determination seems fairly certainly correct, it cannot be identified with one of the few continental species mentioned by Gamble in his monograph of Indian bamboos (*Ann. Roy. Bot. Gard. Calc. VII, 1896, 58*).

Our specimen is characterized by extremely slender culms (younger shoots) and narrow leaves (up to 11 cm long and 0.3 cm broad), with pubescent sheaths and long ciliate ears, the cilia being shining-white and as long as or longer than the internodes (0.7—0.9 cm). It agrees with a plant grown in the Government Botanic Garden at Buitenzorg under the name of *Thyrsostachys siamensis* Gamble (sub signo XI. L. 17), which, however, wants the long-ciliate ears. The species should be compared with the material in 1920 collected by Lam in Central New Guinea, under n. 2150, at a similar altitude (cf. *Nat. Tijdschr. Ned. Ind.* 88, 1928, 290—291 and *Sargentia* V, 1945, 85—86), of which, unfortunately, no material was available.



Fig. 3 — *Thyrsostachys* spec. —

a. part of culm with leaves, nat. size;
b. base of leaf so as to show the ciliate ears, $\times 5$ — after Monod de Fr. 168.

LEMNACEAE

37. *Lemna minor* L., Sp. Pl., 1753, 970.

Celebes: Djampea Isl., south of Salijara, 25 m alt., in stagnant water of rivulet, drinking place of wild boars (*C. Monod de Froideville* 375a, Apr. 1939; L).

Distribution: cosmopolitic.

38. *L. polyrrhiza* L., Sp. Pl., 1753, 970.

Celebes: Djampea Isl., south of Salijara, 25 m alt., stagnant water of rivulet, drinking place of wild boars (*C. Monod de Froideville* 375, Apr. 1939; L).

Distribution: cosmopolitic.

ORCHIDACEAE

(J. J. Smith)

39. **Bulbophyllum falculicorne** J. J. S., Blumea V, 1945, 696, fig. 5.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, 2700 m (*C. Monod de Froideville 108, type specimen*; L).

Possibly related to *B. perpendiculare* Schltr. (N. Celebes), *B. agape-thoides* Schltr. (W. Celebes) and *B. auroreum* J. J. S. (Sumatra).

Distribution: endemic.

40. **Dendrochilum Monodii** J. J. S., l.c., 693, fig. 2.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, in mountain forest at more than 2500 m alt. (*C. Monod de Froideville 110, type specimen*; L).

Related to the following species.

Distribution: endemic.

41. **D. muriculatum** (J. J. S.) J. J. S., Blumea, l.c.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, in mountain forest on more than 2000 m (*C. Monod de Froideville 111*; L).

On account of this specimen *Basigyne muriculata* J. J. S. was transferred to *Dendrochilum*.

Distribution: endemic.

42. **Microstylis mambulilingensis** J. J. S., Blumea l.c. 695, fig. 3.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, 2700 m (*C. Monod de Froideville 106, type specimen*; L).

Related to many Malaysian species, but particularly to *M. purpureo-viridis* J. J. S. from the Talaud Islands. The latter is allied to Papuan species.

Distribution: endemic.

43. **Octarrhena hastipetala** J. J. S. in Bot. Jahrb. LXV (1933), 499.

Celebes: Central Celebes, Mt. Rante Mario, 3000 m (*G. Kjellberg n. 1443, type specimen*, May 1929; L); Mt. Mamboeliling, north of Mamasa, 2700 m, forest of small trees and shrubs (*C. Monod de Froideville n. 164*; L).

Monod's plant is weaker than the type specimen, but I think it belongs here. Related to *O. celebica* Schltr. (Celebes).

Distribution: endemic.

In addition to his herbarium collections, Mr Monod made a number of sketches of Orchids, most of them in colours. Many of these were so exact and well done as to allow an identification. In those cases in which these identifications were certain and the locality of the plant was mentioned, it seemed worth while to insert them in the present list. Some of them represent new records for the Celebes or S. Celebes area. They may follow here:

44. **Acriopsis javanica** Reinw., Fl. Lit. II, 1825, 4.

Celebes: S.E. Celebes, Boeton, Bae-bae.

Distribution: Malay Peninsula to Philippines and Moluccas.

45. **Aerides odoratum** Lour., Fl. Cochinch. II, 1790, 525.

Celebes: S.E. Celebes, Boeton.

Distribution: India and China to Philippines, S.W. and E. Celebes, Kangean and Java.

46. **Asocentrum aurantiacum** Schltr., Orch. D. Neu Guinea 1913, 975.

Celebes: Central Celebes, Mamasa, 1000 m, sunny places on granite; S.E. Celebes, South Saponda, limestone rocks nr coast; Moena, limestone nr coast; N. Celebes, Tomohon; Bolaang Mongondou, Modajag, 750 m.

Distribution: endemic.

47. **Bulbophyllum laxiflorum** Lindl., Gen. et Sp. Orch., 1833, 57.
var. **celebicum** Schltr. in Fedde, Repert. X, 1911, 178.

Celebes: Central Celebes; S.W. Celebes, Oeloe Sadang; S.W. Central Celebes, Pinrang hills.

Distribution of the species: Brit. Malaya, Sumatra, Java; of the variety: endemic.

48. **B. macranthum** Lindl., Bot. Reg. XXX, 1844, t. 13.

Celebes: S.E. Celebes, northern Boeton, coastal hills, 100 m alt., in old forest.

Distribution: Brit. Malaya, Sumatra, Java, P. Lepar (Bangka).
New for the Celebes area.

49. **Caladenia carnea** R. Br., Prodr. Fl. Nov. Holl. 1810, 324.

Celebes: S.W. Celebes.

Distribution: Australia and Lesser Sunda Islands to Java and S.W. Celebes.

50. **Calanthe veratrifolia** R. Br., Bot. Reg. IX, 1823, t. 270.

Celebes: S.W. Celebes, Nepo-nepo, S.E. of Pare-pare, 700 m, in old forest.

Distribution: India to Philippines and Australia.

51. **Coelogyne celebensis** J. J. S., Bull. Jard. bot. Buitenz., Sér. II, Vol. XXV, 1917, 3.

Celebes: S.W. Celebes.

Distribution: endemic (S.W., S.E., C.).

52. **Cymbidium Finlaysonianum** Lindl., Gen. et Sp. Orch. 1833, 164.

Celebes: several localities.

Distribution: Malay Peninsula to Philippines, Celebes, Moena, Soela and Java.

53. **Dendrobium anosmum** Lindl., Bot. Reg. XXI, 1844, Misc. 41.

Celebes: S.E. Celebes, Boeton, Lasalimoe.

Distribution: Borneo, Philippines, Celebes, Kabaena, Boeroe, Ceram, New Guinea.

54. **D. celebense** J. J. S., Bull. Dépt. Agr. Ind. néerl. XLV, 1911, 15.

Celebes: S.E. Celebes, Kabaena, Batoe-Sangia, 700 m.

Distribution: endemic (thusfar only known from N. Celebes).

55. **D. crumenatum** Sw. in Schrad., Journ. Bot. II, 1799, 237.

Celebes: S.E. Celebes, Boeton, Moena.

Distribution: Burma and S. China to Philippines, Moluccas, Celebes and Java.

56. **D. heterocarpum** Wall. ex Lindl., Gen. et Sp. Orch., 1833, 78.

Celebes: S.W. Central Celebes, Pinrang, Letta hills, 700 (900?) m. alt., in old forest.

Distribution: India, Malaya, Sumatra, Java, Celebes, Philippines.

57. **D. Koordersii** J. J. S., Orch. Amb. 1905, 67.

Celebes: S.E. Celebes, Kabaena, Kabaena Peak.

Distribution: N. and S.E. Celebes, Ambon.

58. **D. macrophyllum** A. Rich., Sert. Astrol. 1834, 22, t. 9.
Celebes: S.W. Central Celebes, Pinrang, Letta hills, Sinrang, on ridge, 800 m.
Distribution: New Guinea, Amboina, S.W. Celebes. A variety in Java.
59. **D. nitidicolle** J. J. S., Bull. Jard. bot. Buitenz., Sér. II, Vol. III, 1912, 7.
Celebes: S.E. Celebes, Kendari.
Distribution: S.W. and S.E. Celebes, Soela.
60. **Eria aporoides** Lindl., Journ. Linn. Soc. III, 1859, 60.
Celebes: S.E. Celebes, Boeton, bay of Kamaroe.
Distribution: Philippines, N. and S.E. Celebes.
61. **E. litoralis** Teysm. et Binn., Nat. Tijdschr. Ned.-Ind. XXIV, 1862, 312.
Celebes: S.E. Celebes, Kendari.
Distribution: Moluccas, Celebes (Singapore ?, Tenasserim ?, India ?).
62. **E. quadricolor** J. J. S., Ic. Bog. III, 1906, 31, t. 213.
Celebes: S.E. Celebes, Kendari, on rocks; Boeton, Bae-bae.
Distribution: N. and S.E. Celebes, Boeroe.
63. **Eulophia exaltata** Rehb.f., Bonpl. V, 1857, 38.
Celebes: S.E. Celebes, plain of Langkowala, Roembia.
Distribution: Java, S.W. and S.E. Celebes, Philippines.
64. **Habenaria Medusae** Krzl. in Engl. Bot. Jahrb. XVI, 1892, 203.
Celebes: S.E. Celebes, Boeton, along road Bae-bae to Pasar Wadjo.
Distribution: Sumatra, Java, S.W. and S.E. Celebes.
65. **Microstylis latifolia** J. J. S., Fl. Buitenz. VI, 1905, 248.
Celebes: S.E. Celebes, South-Kendari, in bamboo association on the hills, 150 m alt.
Distribution: India, Ceylon and China to Philippines, New Guinea and Australia.
66. **Nervilia Aragoana** Gaud. in Freyc., Voy. Ur. et Phys., Bot. 1829, 422, t. 35.
Celebes: S.E. Celebes, Kendari, under high trees.
Distribution: India to Philippines and Western Polynesia.
67. **Paphiopedilum Lowii** Pfitz. in Engl. Bot. Jahrb. XIX, 1894, 42.
Celebes: S.E. Celebes, Kabaena, base of Batoe Sangia, 700 m, on rocks.
Distribution: Malay Peninsula, Sumatra, Borneo, Java, N. and S.E. Celebes.
68. **Peristylus bilobus** Rolfe, Kew Bull. 1899, 132.
Celebes: S.W. Central Celebes, Letta hills.
Distribution: Sumatra, Java, Lombok, Celebes, Philippines.
69. **P. candidus** J. J. S., Fl. Buitenz. VI, 1905, 36, fig. XVIII.
Celebes: S.W. Central Celebes, Letta hills.
Distribution: Brit. Malaya to Moluccas.
70. **Pholidota imbricata** Lindl. in Hook., Exot. Fl. II, 1825, t. 138.
Celebes: S.E. Celebes, Boeton, pretty common near coast.

Distribution: India and China to Philippines, New Guinea et Australia.

71. **Sarcanthus selebensis** J. J. S., Svensk Bot. Tidskr. 20, 1926, 480.
Celebes: S.E. Celebes, Boeton, Kalingsoesoe.

Distribution: endemic (N. and S.E. Celebes).

72. **Sarcochilus pallidus** (Bl.) Rehb. f. in Walp., Ann. bot. Syst. VI, 1861, 500.

var. **celebicus** Schltr. in Fedde, Rep. XXI, 1925, 200.

Celebes: S.E. Celebes, Boeton, Lasalimoe.

Distribution of the species: Malay Peninsula to Philippines and Moluccas (Amboina); of the variety: N. and S.E. Celebes.

73. **Trichoglottis geminata** J. J. S., Orch. Amb. 1905, 106.

Celebes: S.E. Celebes, Boeton.

Distribution: Borneo, N. and S.E. Celebes, Moluccas (Amboina, Saparoea).

74. **Vandopsis lissochiloides** Pfitz. in Engl. & Prantl, Nat. Pfl. Fam. II, 6, 1889, 210.

Celebes: S.E. Celebes, Moena, on limestone rocks; S. Saponda Isl., limestone rocks, seaside.

Distribution: Philippines, S.W., S.E. and C. Celebes, Moluccas.

PONTEDERIACEAE

75. **Monochoria vaginalis** (Burm. f.) Presl, Rel. Haenk. I, 1827, 128.

Celebes: Central Celebes, Balokan, north of Makale, 1500 m, locally abundant in stagnant water along road (*C. Monod de Froideville* 188, A° 1938, flow. light lilac; B, L).

Distribution: tropical and subtropical Asia to Philippines and New Guinea.

Dicotyledoneae

ACANTHACEAE

(C. E. B. Bremekamp)

76. **Diffugia Everettii** (Rolfe) Brem., Verh. Ned. Akad. Wet. 2e Sect. XLI, no. 1, 1944, 245.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, 2000 m, in mountain forest (*C. Monod de Froideville* 220 and 221, erect herb, flow., June 5—6, 1938; B, L).

Distribution: endemic (S.W. Celebes).

Its relation is with *D. celebica* Brem. (S.W. Celebes) and with *D. filiformis* (Bl.) Brem. (Java).

77. **Strophacanthus celebicus** Brem., nov. spec.; *typus*: *Monod de Froideville* 195 (L), thecis basi muticis, polline non echinulato ad *Str. membranifolium* (Miq.) Brem. nov. comb. [*Rhaphidospora membranifolia*

Miq.; syn. *Justicia dichotoma* Bl. non Rottl., *Rhaphidospora dichotoma* (Bl.) Nees comb. illeg., *Strophacanthus dichotomus* (Bl.) Lindau comb. illeg.] accedens sed foliis subsessilibus et angustioribus, venulis nervos haud transverse connectentibus, inflorescentiis cymosis haud in paniculam confertis, floribus inferioribus cymorum longius pedicellatis, calyce glabro ab ea recedens.

Herba erecta, 50—75 cm alta, ramosa. *Caulis* ramique graciles, subteretes, internodiis bisulcatis. *Folia* subsessilia, inferiora linearia vel lanceolata, 4—7 cm longa et 0.5—1.5 cm lata, basi acuta, superiora interdum ovato-lanceolata, 2—4 cm longa et 0.7—1.4 cm lata, basi rotundata, omnia apicem versus attenuata, discolora, utrimque subglabra et cystolithis sparsa, nervis utroque latere costae 3—5, venulis paucis nervos haud transverse connectentibus. *Inflorescentiae* terminales et axillares, illae foliis magnitudine paulum redactis suffultae. *Pedunculus* ramulique graciles, pilis capitatis vix distincte puberuli. *Bractae* subulatae vel filiformes, 1—2 mm longae. *Flores* inferiores semper pedicellati, superiores interdum subsessiles. *Pedicelli* pilis capitatis vix distincte puberuli, usque ad 4 mm longi. *Calyx* glaber, 4.5—5 mm longus, fere usque ad basin partitus, lobis filiformibus. *Corolla* alba, 18 mm longa, extus intusque glabra, labio inferiore 3-fido 7 mm, labio superiore 2-fido 6 mm longo. *Stamina* 6 mm supra basin tubi inserta; filamenta glabra 4.5 mm longa; thecae 0.8 mm longae, utroque extremo muticae, connectivo 0.8 mm longo separatae. *Granula pollinis* lenticularia, haud echinulata, 27 μ diam. et 17 μ crassa. *Torus* discoideus. *Ovarium* glabrum, 1.5 mm altum. *Stylus* glaber, 8.5 mm longus. *Stigma* capitatum didymum. *Cap-sula* glabra, 12 mm longa,



Fig. 4 — *Strophacanthus celebicus* Brem., n. sp. — a. habit, nat. size; b. nervation (lower side), $\times 1\frac{1}{2}$ — after type specimen.

retinaculis 2 mm longis, patentibus. Semina 2.5 mm longa, 2 mm lata, rugosa — *Fig. 4*.

Habitat terram celebicum.

Celebes: Central Celebes, Palopo, Makale, Balokan, north of Makale, alt. 1500 m, in partly cleared forest (*C. Monod de Froideville 195*, *typus*: erect herb, 50–75 cm high, flow. white; B, L).

The new species described above comes very near to the Javanese *Str. membranifolius* (Miq.) Brem. Lindau used for the latter the name *Str. dichotomus*, which was based on *Justicia dichotoma* Bl. Blume's specific epithet, however, is illegitimate, as it had already been used for another species.

The genus *Strophacanthus* is represented in the Lesser Sunda Islands and in the Moluccas by some more species, which are all nearly related to *Str. membranifolius* and *Str. celebicus*. From *Str. collinus* (T. And.) Lindau, the only species found outside the Archipelago (Sikkim and Upper Burma), they differ in the smaller size and the glabrous surface of the pollen grains.

BORAGINACEAE

78. *Cynoglossum javanicum* (Thunb.) DC., Prodr. X, 1846, 588.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, open summit, 2900 m, some scattered specimens (*C. Monod de Froideville 228*, erect herb, about 0.75 m high, flow. bright blue, June 5–6, 1938; B, L).

Distribution: India and Ceylon to Java and S.W. Celebes (Bonthain 1480–2200 m; *Bünnemeyer 12064* and *11843*; Lombasang, 950–1330 m: *Id. 10948* and *11204*).

79. *Cynoglossum micranthum* Desf., Cat. Hort. Par. 2804, 220.

Celebes: Central Celebes, along the road Polewali–Tomonga–Mamasa, about 1000 m, dry sunny roadside, one specimen (*C. Monod de Froideville 269 A° 1939*, erect herb, about 1 m high, flow. pale blue; B, L).

According to Merrill (Enum. Phil. Flow. Pl. III, 1923, 379) this species is a synonym to *C. lanceolatum* Forssk. (1775) and is also distributed in the Philippines.

Distribution: Africa and India to Sumatra and Java. New for Celebes.

CAMPANULACEAE

80. *Pratia borneensis* Hemsl. in Hook., Ic. Pl. XVI, 1886, t. 1532.

Celebes: Central Celebes, Makale, Rantepao, in young forest, about 1600 m (*C. Monod de Froideville 192*, shrub with beautiful blue flowers; L) — Celebes, Mt. Katongkoan (*Rachmat [Exp. L. van Vuuren] 1007*, Jan. 1914, flow.; B, L); Mt. Batoe (*Id. 435*, Aug. 1913, flow.; B, L).

Borneo: Brit. North Borneo, Mt. Kinabalu, Tenompok, forest trail, 5000 ft (*J. & M. S. Clemens 27474*, shrub, reclining 4 ft high, flow. white, lavender tinged, fr.

green, Dec. 10, 1931); same locality, Marai Parai, 5500 ft. (*Id.* 32437, flow. purple or white, March 29, 1933) and Colombon riv. 9500 ft. (*Id.* 35055, flow. white and purple, June 30, 1933).

Distribution: thusfar only known from Mt. Kinabalu, new for Celebes.

81. **P. nummularia** (Lamk.) Kurz, Journ. As. Soc. Beng. 46, 1877, 210.

Celebes: Central Celebes, Balokan, north of Makale, 1500 m (*C. Monod de Froideville* 193, procumbent herb, flow. lilac; B, L).

Distribution: India and China to Formosa, the Philippines and Java. Probably new for Celebes.

82. **Wahlenbergia gracilis** (Forst.) Schrader, Blumenbachia 1827, 38; A. DC. in DC., Prodr. VII, 1838, 433.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, 1800 m, between grasses (*C. Monod de Froideville* 219, erect herb, about 30 cm high, flow. lilac, June 5—6, 1938; B, L).

Possibly identical with *W. marginata* (Thunb.) A. DC.

Distribution: palaeotropics and temperate parts of southern hemisphere.

CARYOPHYLLACEAE

83. **Cerastium indicum** Wight & Arn., Prodr. Fl. Pen. Ind. or. 1834, 43.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, open vegetation below summit, 2800 m, fairly abundant in the grass (*C. Monod de Froideville* 226, small erect herb with white flowers, June 5—6, 1938; B, L).

Distribution: India to Java; probably new for Celebes.

84. **Sagina procumbens** L., Sp. Pl., 1753, 128.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, open vegetation of summit, 2900 m (*C. Monod de Froideville* 240, flow. white, June 5—6, 1938; B, L).

Distribution: temperate regions of both hemispheres and tropical mountains.

COMPOSITAE

(J. Th. Koster)

85. **Anaphalis longifolia** (Bl.) DC., Prodr. VI, 1837, 274.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang on open summit, 2900 m, frequent (*C. Monod de Froideville* 239, herb, about 75 cm high, flow., June 5—6, 1938; B, L).

Distribution: Sumatra, Java, Lesser Sunda Isl., Celebes, Moluccas, New Guinea.

86. **Gnaphalium involucratum** Forst., Fl. Ins. Austr. 1786, 55.

Celebes: S.W. Celebes, Kanre-apia nr. Malino, some specimens in grass vegetation at base of Peak of Bonthain, 1300 m alt. (*C. Monod de Froideville* 383; L).

Distribution: New Zealand and Australia to Lombok, Java and Celebes.

87. **G. japonicum** Thunb., Fl. Jap. 1784, 311.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, open summit, 2900 m, some specimens (*C. Monod de Froideville 243*, herb, about 40 cm high, June 5—6, 1938; B, L).

Distribution: Japan and China and Formosa southward to New Caledonia, New Zealand and Australia, westward to Sumatra (here rare).

88. **Lactuca dentata** (Thunb.) C. B. Rob., Phil. Journ. Sci. III Bot., 1908, 218.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, abundant on open summit, 2900 m (*C. Monod de Froideville 244*, herb with yellow flow., June 5—6, 1938; B, L).

Distribution: China, Japan, Formosa, Philippines, Celebes, Moluccas, New Guinea.

89. **Myriactis**, prob. nov. spec.

Celebes: Central Celebes, Mt. Rante Karoea, north of Makale, 2000 m, in rain-forest on bank of rivulet (*C. Monod de Froideville 200*, erect herb, A° 1938; B, L).

Close to *M. humilis* Merrill (cf. Enum. Phil. Flow. Pl. 3, 1923, 600) from the Philippines (Luzon to Mindanao).

CONVOLVULACEAE

(S. J. van Ooststroom)

90. **Evolvulus alsinoides** L., Sp. Pl. ed. 2, 1762, 392.

Var. **decumbens** (R. Br.) v. Ooststr., Monogr. Evolv. 1934, 38.

Celebes: S.W. Celebes, Tjamba-road (Maras—Watampone), about 300 m alt., some specimens on cattle grounds (*C. Monod de Froideville 381*, A° 1938; L) — Central and S.E. Celebes, Mori, Makan, Ensa and Kolaka (*W. A. Kaudern 352*, June 1919; Stockh., L).

Distribution of the species: tropics and subtropics; of the variety: India and China to Australia and W. Polynesia.

CRUCIFERAE

91. **Nasturtium indicum** (L.) DC., Syst. 2, 1821, 199 and Prodr. I, 1824, 139.

Celebes: Central Celebes, Palopo, Bone-bone, nr. Masamba, some specimens in swampy savannah (*C. Monod de Froideville 393*, A° 1938, flow. yellow; L).

Distribution: Tropical Asia and Malaysia.

CUNONIACEAE

92. **Weinmannia urdanetensis** Elm., Leaf. Phil. Bot. 7, 1915, 2608.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, subalpine elfin-

woodland, 2700 m, one specimen seen (*C. Monod de Froideville 119*, A° 1938, shrub or small tree, ster.; B, L).

First extra-Philippine record of this species. Although the specimen is sterile and the leaves differ slightly from Elmer's type specimen (up to 23 leaflets in the leaf, the leaflets up to 10×6 mm, reddish), I hardly doubt the correctness of the identification. It is a very characteristic small-leaved species.

Distribution: Philippines (Luzon, Mindanao).

EPACRIDACEAE

93. *Styphelia suaveolens* (Hook. f.) Koord., Rec. Trav. bot. néerl. VII, 1910, 65 — *Leucopogon suaveolens* Hook. f., Ic. Pl. 1852, sub tab. 898; Vidal, Sinops. Atl. 1883, 30, t. 60, f. A. — *S. philippinensis* Merrill, Phil. Journ. Sc. 20, 1922, 419.

Borneo: Brit. North Borneo, Mt. Kinabalu, prob. from 12,000 ft. (*Coll. 1062*, March 1892, petals white); Mt. Kinabalu, Base of Victoria Peak, 12,000 ft. (*J. & M. S. Clemens 50874a*, Dec. 17, 1933, flow. & fr.); Mt. Kinabalu, Gurulau spur, upper granite lobang, 12,000 ft. (*J. & M. S. Clemens 50875*, 8. XII. 1933, flow. pink white); Upper Kinabalu, 6000—13,500 ft. (*Id. 27779 = 23995*, Jan. 9, March 29, 1932, flow. white, lvs. green above with purple margins, glaucous; *Id. 27097*, Nov. 14, 1931, flow. white to pinkish, fr. brown, and *27097B*, Nov. 4, 1931, same annot.; *Id. 29130*, March 26, 1932, y. fr.; *Id. 30374*, June 2, 1932, flow. white; *Id. 30375*, Jan. 12, 1932, flow. white); Mt. Kinabalu, Marai Parai, 11,000 ft. (*J. & M. S. Clemens 32380*, May 26, 1933, flow. white).

Mindanao: Davao, Todaya, Mt. Apo (*Elmer 11389*, fr., Aug. 1909).

Celebes: S.W. Celebes, Peak of Bonthain, 2800 m (*Bünnemeyer 12184*, 15. VI. 1921, flow. & fr.); same locality, 2890 m (*Id. 12254*, 17. 6. 1921, flow.); same locality, 2300 m (*Id. 11896*, 7. 6. 1921, flow. & fr.); Peak of Bonthain, Mt. Lompobatang, 2700—2850 m (*Neth. Ind. For. Serv. s.n.*, 27. 9. 1933, flow.); same locality, 2900 m, open vegetation on summit (*Monod de Froideville 232*, June 5—6, 1938, shrub about 1.5 m high, flow. white, fr. pink).

Lesser Sunda Islands: Timor, Fetin, 1800 m (*For. Officer Koepang 8*, 10. IV. 1935, flow. buds).

The above enumeration quotes the material extant in the National Herbarium, Leiden. The material examined is uniform in all essential points and its variability, even in the same specimen shows that there is no reason to keep *S. philippinensis* apart.

S. suaveolens is characterized by white or pinkish flowers, the petals of which are short-woolly inside almost up to the tips; the ovary is 5-celled; in the putamen I found 1—3 cells abortive. In many respects it agrees with *S. pungens* (Jungb.) Koord. from Eastern Java but it misses the very conspicuous spiny leaf tips of the latter and moreover the woolly indumentum on the petals is much less profusely developed than in *S. pungens*. Very close to the latter is a plant from Wetar (Lesser Sunda Islands) described as *S. wetarensis* J. J. S. This species agrees with *S. pungens* by its pungent leaf tips but it has a much stouter habit (which is perhaps due to the fact that it is not a mountainous plant like *S. pungens*), and the leaf margins are entire or nearly so, whilst the nerves are fainter.

In *S. suaveolens* the leaves are ovate to oblong or lanceolate or oblanceolate, the apex being obtuse to acute. The dimensions are 5—16 mm long, 1.4—2.8 mm broad, the petioles 0.5—1(—1.2) mm. Various shapes and dimensions may be found even in the same specimen, but the species is always easily distinguishable by its characteristic venation: three of the nerves are broad and strong and are running straight and parallel up to the very apex, the others are less strong and fanlike diverging towards the margins.

As to the venation two main types are represented among Malaysian *Stypheliae* (Fig. 5, a—g):

I. the fanlike type just described, which is found in *S. pungens*, *S. suaveolens*, *S. spicata* J. J. S. (New Guinea), *S. trilocularis* J. J. S. (New Guinea) and *S. obtusifolia* J. J. S.¹⁾ (New Guinea). The two last-named species are very close to *S. suaveolens* and perhaps conspecific with it.

II. a type with numerous very faint nerves, the individual course of which can hardly be traced. It is found in *S. malayana* (Jack) J. J. S. (Malay Peninsula to Java), *S. abscondita* J. J. S. (New Guinea), *S. moluccana* (Scheff.) J. J. S. (Moluccas and Talaud) and

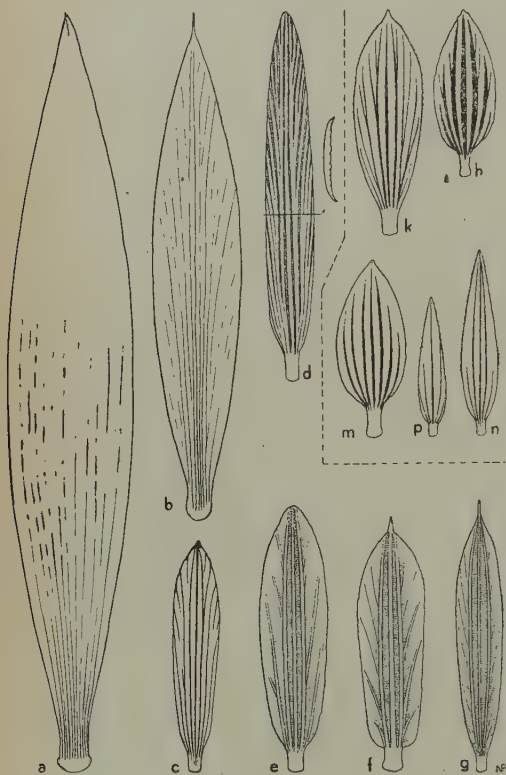


Fig. 5 — Venation types in Malaysian Epacridaceae. a—g. *Styphelia*, h—p. *Trochocarpa*. a. *St. malayana* (Jack) J. J. S.; b. *St. moluccana* (Scheff.) J. J. S.; c. *St. suaveolens* (Hook.f.) Koord.; d. *St. spicata* J. J. S.; e. *St. obtusifolia* J. J. S.; f. *St. pungens* (Jungh.) Koord.; g. *St. wetarensis* J. J. S. — h. *Tr. Vannouhuysii* (J. J. S.) H. J. Lam; k. *Tr. nutans* (J. J. S.) H. J. Lam; m. *Tr. Learmonthiana* (Gibbs) H. J. Lam; n. *Tr. celebensis* (J. J. S.) H. J. Lam; p. *Tr. Gjellerupii* (J. J. S.) H. J. Lam — all figures $\times 10/3$.

S. lancifolia Hook.f. (Brit. N. Borneo). Possibly the two last-named

¹⁾ The picture in Nova Guinea VIII⁴, tab. CXLIII, fig. 2, is misleading in this respect, at least as regards the authentic specimens extant in the National Herbarium (A. Pulle 970, G. M. Versteeg 2413 [var. *hypoleuca* J. J. S.] and 2529).

species (and *S. abnormis* [Sond.] J. J. S. ?) will prove to be conspecific.

Of the remaining Malaysian species no material or — in this respect — adequate descriptions were available, viz. of *S. abnormis* (Sond.) J. J. S. (Waigeo), *S. obovata* (Fawe.) J. J. S. (Timor) and *S. papuana* (C. H. Wright) J. J. S. (New Guinea). See further under *Trochocarpa*.

94. ***Trochocarpa celebica*** (J. J. S.) Van Steenis, n. comb. — *Styphelia celebica* J. J. S., Ic. Bog. IV, fasc. 1 (XIII), 1910, 81, tab. CCCXXV.

Celebes: C. Celebes, Mt. Mamboeliling, north of Mamasa, 2700 m, frequent in subalpine thickets (C. Monod de Froideville 127, A° 1938, shrub about 0.75 m high, with dull blue-purple berries).

The type locality is Mt. Boeloe Palaka, one of the peaks of the Latimdjong range in C. Celebes.

In Nova Guinea VIII⁴, 1912, 797, J. J. Smith suggested the possibility that *S. celebica*, of which at the time the fruit was unknown, might prove to be a representative of the chiefly Australian genus *Trochocarpa*. The above specimen enables a decision in this matter: the fruits contain 10 distinctly separate pyrenes, on account of which the species had to be transferred to *Trochocarpa*. The new combination, although without an author's name, has already been mentioned by Van Steenis in his "Origin of the Malaysian Mountain Flora", Part 3, p. 69. As far as I can trace it has never been published and this is why we publish it here with Van Steenis as the creator of the new combination. The leaves are provided with minute scales between the nerves underneath.

The same procedure seems to be necessary regarding three Papuan species, as was previously presumed by Smith. They are:

94a. ***Trochocarpa nutans*** (J. J. S.) H. J. Lam, nov. comb. — *Styphelia nutans* J. J. S., Nova Guinea VIII⁴, 1912, 798 and 800, tab. CXLV.

New Guinea: S.W. New Guinea, Mt. Hellwig, 2600 m (*A. Pulle* 590).

94b. ***Trochocarpa Vannouhuysii*** (J. J. S.) H. J. Lam, nov. comb. — *Styphelia Vannouhuysii* J. J. S., l.c. 798 and 801, tab. CXLVI A.

New Guinea: S.W. New Guinea, summit of M. Wichmann, 3000 m (*A. Pulle* 973); Oranjeberge, Meervallei, 3000—4000 m (*G. M. Versteeg* 2544).

94c. ***Trochocarpa Gjellerupii*** (J. J. S.) H. J. Lam, nov. comb. — *Styphelia Gjellerupii* J. J. S., Nova Guinea XII⁵, 1917, 540, tab. CCXXV.

New Guinea: N.W. New Guinea, Arfak Mts., 2500 m (*K. Gjellerup* 1184, type specimen B; L).

Two other species, described as *Styphelia*, are critical in this respect by their 10-celled ovaries: *S. Dekockii* J. J. S. (New Guinea) and *S. Learmonthiana* Gibbs (Brit. N. Borneo, Mt. Kinabalu). Of both the fruits are unknown but there is another character which makes it probable that they too are to be inserted in *Trochocarpa*. Three of the species quoted above (*T. celebica*, *Vannouhuysii*, *Gjellerupii*) and, though to a lesser degree, also *nutans* namely, show a type of venation which is distinctly different from that of the Malaysian *Stypheliae*. The nerves are neither fanlike diverging nor faint and numerous but they are few in number (5—7) and mostly strong and conspicuous and sometimes prominent below. Only the central one is straight, the others are curved more or less parallel to the leaf-margins (*Fig. 5*, h—p; see further under *T. Learmonthiana*). This condition is convincingly extant both in *S. DeKockii*

and in *S. Learmonthiana* and I therefore do not hesitate to propose the following new combinations:

94d. **Trochocarpa DeKockii** (J. J. S.) H. J. Lam, nov. comb. — *Styphelia DeKockii* J. J. S., Nova Guinea VIII⁴, 1912, 802, tab. CXLVI B. New Guinea: (*De Kock 83*).

I did not examine the specimen quoted.

94e. **Trochocarpa Learmonthiana** (Gibbs) H. J. Lam, nov. comb. — *Styphelia Learmonthiana* Gibbs, Journ. Linn. Soc. Bot. XLII, 1914, 105 (with fig. p. 106).

Borneo: Brit. North Borneo, Mt. Kinabalu, Upper Lobang, Gurulau Spur, nr. Umpoh, 12,000 ft. (*Clemens 50874*, buds pink, fr. purple, on Dec. 8, 1933); Upper Kinabalu, 6000—13,500 ft. (*J. & M. S. Clemens 28956*, ster., 25.3.1932).

I did not see the type specimens (*L. S. Gibbs 4126* and *4305*), both from Mt. Kinabalu. With *T. celebica* the present species occupies the westernmost outposts of this Australian genus. The leaves are minutely pitted below between the nerves. These pits recall those of many *Ericaceae*, particularly *Rhododendron* and may be the places of insertion of fallen scales (cf. *T. celebica*).

I add here with little doubt a seventh species which on account of its 10-loculate ovary probably also belongs to *Trochocarpa*:

94f. **Trochocarpa Lamii** (J. J. S.) H. J. Lam, nov. comb. — *Styphelia Lamii* J. J. S., Nova Guinea XVIII, 1936, 123, Tab. XXXIII¹.

New Guinea: N. New Guinea, Mt. Doorman (*H. J. Lam 1802*).

I did not examine any specimen. According to Smith's picture, the venation seems to be more or less fan-shaped as it is in the closely related *T. nutans*.

The venation-type described above is best developed in *T. Learmonthiana*, *DeKockii* and *Vannouhuysii*. In *T. Gjellerupii* and *T. celebica* the nerves are weaker and less prominent; in *T. nutans* and *T. Lamii*, however, they are many and faint, thus showing a tendency towards type II described under *Styphelia*. In all species, the outermost nerves are more or less distinctly branched on their marginal side.

It should be emphasized here that of the species mentioned, all possess two (one pair) of bracteoles underneath the calyx, except *T. Learmonthiana*, in which there are four (two pairs), and *T. Lamii*, in which there seem to be at least two pairs.

ERICACEAE

95. **Diplycosia undata** J. J. S. in Fedde's Repert. XXX, 1932, 171.

Celebes: C. Celebes, Mt. Mamboeliling, north of Mamasa, 2700 m, in sub-alpine thickets (*C. Monod de Froideville 124*, A² 1938, shrub; L, B).

The type specimen is from the Peak of Bonthain in S.W. Celebes. Closely related to *D. pokapindjangensis* J. J. S. and *D. aperta* J. J. S., both from the Latimodjong range in C. Celebes.

Distribution: endemic.

96. **Rhododendron quadrasianum** Vidal, Rev. pl. vase. Fil. 1886, 170; H. F. Copeland, Phil. Journ. Sci. 40, 1929, 139 ss. — *Rh. Lindavianum* Koord., Nova Guinea VIII⁴, 1912, 878; XII⁵, 1917, 498; and XVIII, 1936, 89.

In his paper of 1929 H. F. Copeland has united a number of small-leaved *Rhododendra* under the name of *Rh. quadrasianum* Vid. On account of the many transition forms between the extremes this conclusion is probably correct, though H. Sleumer (Engl. Bot. Jahrb. 71, 1941, 139—140) apparently keeps *Rh. rosmarinifolium* Vid. separate.

I am, however, inclined to agree with Copeland and to accept *Rh. quadrasianum* as a large polymorphous species, but I must state that, in my opinion, Copeland's subdivision of the species into forms and varieties, arranged as they are in a more or less haphazard way, seems little adequate. It would, perhaps, have been preferable to combine the small-leaved forms (f. *halconense*, var. *intermedium*, var. *rosmarinifolium*, f. *pulogense*, var. *borneense*, var. *villosum* and var. *selebicum*) as a ssp. *rosmarinifolium*, keeping the larger-leaved ones (f. *typicum*, f. *marivelesense*, f. *negrosense*, f. *malindangense*, f. *davaoense*, f. *banahaoense* and var. *cuneifolium*) together as a ssp. *typicum*. These subspecies could then have been subdivided into varieties, and these again, eventually, into forms. As it is, however, it seems preferable to follow Copeland's subdivision, until a monographer undertakes a new revision of the genus (or of its Malaysian species); at any rate, it cannot be considered our present task to give a critical study of this matter.

I will therefore restrict myself to the following notes:

One of the secondary points of distinction used to characterize the varieties and forms — of which I could examine some types and several authentic specimens quoted by Copeland, except of f. *halconense*, var. *cuneifolium* and var. *subspathulatum* — is whether the pedicels are pubescent and lepidote or not. Although the differences are gradual, this seems to be a fairly useful character. Now f. *pulogense* H. F. Cop. (as well as var. *selebicum* J. J. S., the description of the type of which is, as to this character, not entirely correct) is characterized by non-puberulous pedicels. They are mostly more or less densely lepidote, but in the specimens from Mt. Kinabalu (identified by Sleumer as *Rh. cuneifolium* Stapf), the scales are almost or even entirely lacking, at least when bearing fruits. In our f. *Monodii* the pedicels are of the same type as in f. *pulogense*; in fact, these are the only forms of the species in which the pedicels may be qualified as non-puberulous, with the exception of some plants from New Guinea which will be discussed underneath.

Forma **pulogense** H. F. Copel., l.c. 144 — *Rh. quadrasianum* Vid. var. *selebicum* J. J. S., Bull. Jard. bot. Buit. Sér. III, Vol. XIII, 1935, 443 and in Engl. Bot. Jahrb. 68, 1937, 199 — Pedicelli lepidoti, nonnunquam glabrescentes laeves, interdum basi sparsissime pilosi (diagn. emendata).

Luzon: Mt. Polis (*Mc Gregor* 19736, flow. Febr. 1912); Benguet (*Merrill* 4752, flow. Oct.-Nov. 1905).

Borneo: Brit. North Borneo, Mt. Kinabalu, Mt. Nunkok 5500 ft. (*J. & M. S. Clemens* 32707, flow. red, fr. yellowish green, 17.4.1933); Mt. Kinabalu, Kina Taki river, 7000 ft. (*Iid.* 31692, flow. red, 26.2.1933); Upper Kinabalu 6000—13.500 ft. (*Iid.* 27912, flow. pink, 7.1.1932).

Celebes: Mt. Balobetoding (*Rachmat* [Exp. *L. van Vuuren*] 933 [type of var. *selebicum* J. J. S.], flow. Nov. 1913); Central Celebes, road Makale-Bitoang, in open vegetation, about 1200 m (*C. Monod de Froideville* 187, A° 1938, smal shrub; B, L).

Distribution of *fa. pulogense*: Celebes, Borneo, Luzon.

Forma **Monodii** H. J. Lam, nova forma — Ut *f. pulogense* sed foliis latioribus obovato-spathulatis c. 12 mm longis, 5 mm latis.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, 2700 m, in subalpine bush (*C. Monod de Froideville* 120, shrub, A° 1938; B, L).

I may add a few remarks concerning:

Var. **villosum** J. J. S., Bull. Jard. bot. Buitenz., Sér. III, Vol. XIII, 1935, 444 — Pedicelli, ovarium, fructus plus minusve dense pilosi (diagn. emend.).

Borneo: W. Borneo, G. Damoes (*Hallier* 575, type specimen of the variety; B, L); Brit. North Borneo, Mt. Kinabalu, Marai Parai, 5000 ft. (*J. & M. S. Clemens* 32326 = 32989, flow. red, March 23 to Apr. 27, 1933); Mt. Kinabalu, Penibukan, head of Dahombong Cr., in crotch of great oak, 5000 ft. (*Iid.* 40664, epiphytic shrub 4—6 ft., flow. lemon yellow¹); same locality, 4000—5000 ft. (*Iid.* 31944, flow. l. yellow¹), March 7, 1933); same locality, 5000—5500 ft., epiphytic on 200' Dipterocarp (*Iid.* 40575, flow. bright yellow¹), Oct. 4, 1933); Mt. Kinabalu, Penataran basin 5500 ft. (*Iid.* 32449, fr. Aug. 3, 1933).

Distribution: Borneo.

With var. *borneense* J. J. S. (l.c.) the present variety seems to be the only one with a pilose ovary. In *n.* 32449 the fruits are distinctly villous outside; this character is thusfar unknown in the species as far as I am aware.

The Kinabalu specimens (except *n.* 32326) were identified by Sleumer as *Rh. cuneifolium* Stapf.

In the above delimitation *Rh. quadrasianum* is distributed in Borneo, the Philippines and Celebes. However, there seems to be hardly any doubt whether some small-leaved Papuan species are conspecific with *Rh. quadrasianum*. I will restrict myself here to mention particularly *Rh. Lindavianum* Koord., which with its var. *bantaengense* J. J. S. (Fedde's Repert. XXX, 1932, 163) from S.W. Celebes seems to fall entirely within the specific boundaries of *Rh. quadrasianum*.

As has already been stated by J. J. Smith, *Rh. Lindavianum* is closely related to *Rh. Meliphagidum* J. J. S. (l.c. 162) from Ceram and it is certainly remarkable that the latter possesses yellow flowers (in *Rh. Lindavianum* red), cf. our var. *villosum* f. *lutea* with yellow and f. *bana-haoense* H. F. Copel. with orange-coloured flowers.

In the Papuan specimens, however, identified as *Rh. Lindavianum*, which I was able to examine (*Pulle* 574, 578, 820, 828, 895; Bünnemeyer [var. *bant.*] 12250 [type], 12223) the pedicels, ovary and fruit seem always to be lepidote but non-pubescent. As to *Rh. Meliphagidum*, this species is distinguished by larger leaves and flowers and, in this respect, is forming a transition to *Rh. retusum* Benn. from Sumatra and Java, in which the leaves are still larger. In *Rh. quadrasianum* they may be said to be

¹) These three nrs. might be considered a forma nova *lutea*, but I failed to detect any other point of distinction with *n.* 32326 which has red flowers (f. *rubra*), or with *n.* 32449, which possesses fruits only. The only difference from the type specimen of the variety, apart from an eventual difference in the colour of the corolla (which is unknown in *Hallier* 575) seems to be that in the type specimen the leaves are dark reddish brown when dried, in the Kinabalu specimens, however, greenish brown.

up to 30 mm long and up to 13 mm broad — in the small-leaved forms they are only 5—12 × 2—5 mm —; the corolla may vary between 8—25 mm in length.

The specimens quoted for *Rh. Lindauianum* are by no means uniformous. There are, for instance, such with large and others with small leaves. I leave it to a monographer to arrange these into varieties or forms if such a procedure should appear desirable, the more so, as I am pretty well convinced that still other Papuan species will prove to belong to the present species. In the meantime I would consider the var. *bantaengense* (J. J. S.) as a separate variety, distinguished by non-pubescent pedicels and ovaries and by large obovate leaves (10—22 × 6—10 mm).

97. **Rh. Vanvuurenii** J. J. S., Bull. Jard. bot. Buitenz., Sér. III, Vol. I⁵, 1920, 399, Tab. 48.

Celebes: C. Celebes, Mandar, Mamasa, 1000 m, fairly frequent in open vegetation (*C. Monod de Froideville* 398, A° 1939, shrub, 1.25 m high; L).

The relation of this species is with *Rh. lompohense* J. J. S. from Celebes, *Rh. Loerzingii* J. J. S. from Java, *Rh. javanicum* (Bl.) Benn. from Western Malaysia and *Rh. Schadenbergii* Warb. from Luzon (= *Rh. javanicum* ?).

Distribution: endemic (S.W. and C. Celebes).

98. **Rh. Zollingeri** J. J. S., Ic. Bog. IV, fasc. 1, 1910, 73, tab. CCCXXII.

Var. *latifolium* J. J. S. in Engl. Bot. Jahrb. 68, 1937, 200.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, steep, stony slope, 2700—2850 m (*J. van Zijll de Jong* 6, shrub, flow. red, y. fr. green, 27.IX.1933; B); same locality, Mt. Bawakraeng, steep, stony slope, 2800 m, scattered (*Id.* 23, shrub, flow. red, ripe fr. reddish brown; B) — C. Celebes, divide between Palopo and Rantepao, in open vegetation on slopes along the road, 1200 m, several specimens (*C. Monod de Froideville* 271, shrub, about 1.25 m high, flow. red or brick-red; L, B); Mamasa, Oeroeboea, 1600 m (*Neth. Ind. For. Serv.* 188, flow. and fr. on 16.7.1936; L, B); G. Sinadji (*Rachmat* [Exp. *L. van Vuuren*] 883, flow. in Nov. 1913; L, B).

Distribution: The type specimen of the variety, which is endemic, is *Kjellberg* 3925 from C. Celebes, Mt. Rante Mario, 2500 m. The species is distributed on the higher peaks of Central and East Java (Dieng: *Lörzing* 482, *Van Steenis* 4597, both from ± 2000 m; Kraksaan, 3050 m: *Neth. Ind. For. Serv. Ja.* 2997; Mt. Ijang, 3000 m: *Backer* 9725; Mt. Argapoera, 3000 m: *Zollinger* 1684 [*type spec.*]), Bali, (Mt. Batoka, 1360 m: *Sarip* [exp. *R. Maier*] 397) and Lombok (Mt. Rindjani, 2400—3000 m: *Elbert* 1094, 1362 and 2241).

EUPHORBIACEAE

99. **Acalypha boehmerioides** Miq., Fl. Ind. Bat. Suppl., 1860, 459.

Celebes: S.W. Celebes, Bone, Sopeng, nr. Tjitta, in coconut grove about 400 m alt., one specimen (*C. Monod de Froideville* 389, undershrub, 60 cm high, flow., A° 1938; L).

Distribution: India to Philippines and Western Polynesia.

100. **Euphorbia hirta** L., Sp. Pl. 1753, 454.

Celebes: S.W. Celebes, Bone, Oedjoeng Lamoeroe, about 250 m alt., abundant on cattle grounds (*C. Monod de Froideville* 386, A° 1939; L).

Distribution: pantropical.

101. **E. hypericifolia** L., Sp. Pl. 1753, 454.

Celebes: Central Celebes, along road Makale-Bitocang, about 1000 m alt., on cattle grounds (*C. Monod de Froideville* 261, bracts of cyathia white; B, L).

Distribution: pantropical.

102. **E. serrulata** Reinw. ex Bl., Bijdr. 1826, 635.

Celebes: without further indication of locality (*C. Monod de Froideville* 396, A° 1938, bracts of the cyathia white; L).

Distribution: S. China to Australia and Polynesia.

FAGACEAE

103. **Quercus acuminatissima** (Bl.) A. DC. in DC., Prodr. XVI², 1864,

102 — *Castanea acuminatissima* Bl., Mus. bot. Lugd. Bat. I, 1850, 283 — *Quercus Junghuhnii* Miq., Fl. Ind. bat. I, 1856, 853.

Celebes: Central Celebes, Palopo, abundant in forest nr. resthouse Balokan, north of Makale, 1500 m (*C. Monod de Froideville* 184, A° 1938, tree, wood used for making sirap = wooden pan tiles; B, L).

Apparently close to but probably not conspecific with *Q. mindanaensis* Elm. from Mindanao and Leyte which differs by the shallow cupula with smooth circular rim and less scaly outer surface.

Distribution: Siam, Sumatra, Java, Celebes, Moluccas, New Guinea.

GENTIANACEAE

104. **Gentiana uncifolia** H. J. Lam, nov. spec. — *Fig. 6* — *Herba* vel *suffrutex* pusilla caespitosa procumbens stolonifera glabra, rosulis c. 1.5—2.5 cm altis. *Folia* coriacea in rosulis dense conferta, in ramulis novellis suberectis distantes decussata, omnia sessilia, duo ejusdem paris basi confluentia, divaricata, linearia vel oblongo-linear, basi sensim angustata, apice latiore subacuta, saepe sursum plicata, semper apice uncinatim recurvata, 0.6—1.1 cm longa, 0.1—0.2 cm lata, marginibus interdum revolutis, nervo unico vix conspicuo, sub flore nonnulla (2—3 paria) modo paracalyeis confertim ad calycem adpressa. *Flores* glabri solitarii apicales sessiles, 1.2—1.5 cm longi, caule sub “paracalyce” saepe 0.2—0.8 cm afoliosa. *Calyx* nonnumquam nullus quod si ita est foliis adpressis substitutus, si adest membranaceus cylindraceo-conicus c. 0.55 cm longus, apicem versus paulo dilatatus, lobis 5 peracutis 0.25 cm longis. *Corolla* cyanea membranacea, tubo anguste infundibuliformi 1—1.2 cm longo, lobis ovatis aestivatione convolutis apice minute apiculatis ogivatis 0.2—0.25 cm longis et latis, plicis interpetiolaribus haud protractis integris. *Stamina* 5 corollae lobis alternantia, filamentis c. dimidio tubi affixis filiformibus, antheris parvis 0.075 cm longis triangularibus basi bilobis, stigmatibus adpressis. *Ovarium* claviforme, stylo filiformi stigmatibus duobus extrorsum arcuatis c. 0.1 cm longis. *Capsula* ignota.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, rather frequent in open places of subalpine bush, 2700 m (*C. Monod de Froideville* 118, type specimen, L, forming cushions, flow. deep blue; B, L).

Undoubtedly a new species, more or less related to *G. quadrifaria* Bl. (India and Java), *G. lycopodioides* Stapf (Brit. N. Borneo: Mt. Kinabalu)

and the small-leaved species from the Philippines (cf. Merrill, Enum. Phil. Flow. Pl. III, 1923, 318), which seem all to be close together and from which *G. uncinata* differs by its long, narrow and uncinately leaves and its "paracalyx"; probably also to *G. lateriflora* Hemsl. from Bonthain Peak, from which it differs by its much smaller leaves and flowers. It is, however, more closely related to *G. borneensis* Hook.f. from Mt. Kinabalu from which our species is different by the still narrower and longer leaves, the more prominent "paracalyx" and the often for several mm



Fig. 6 — *Gentiana uncinifolia* H. J. Lam, n. sp. — a. habit, $\times 3/5$; b. flower with three pairs of supporting leaves, $\times 1.7$; c. calyx with uppermost pair of supporting leaves, $\times 2.6$; d. corolla outside, $\times 2.6$; e. part of ditto with three stamens and pistil, $\times 2.6$ — after type specimen.

leafless stem below it, the interpetiolar lobes being absent or nearly so, and the relatively large flowers.

GERANIACEAE

105. *Geranium ardjunense* Zoll. & Mor., Nat. en Geneesk. Arch. Neerl. Ind. II, 1845, 585.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, rather abundant in subalpine elfin woodland below summit, 2800 m alt. (C. Monod de Froideville 229, herb, flow. red-purple, June 5—6, 1938; B, L); Peak of Bonthain, 2500 m (H. A. B. Bünnemeyer 11906, flow., 8. VI. 1921; B, L).

According to Monod also found on Mt. Bawakraeng (northern top of Peak of Bonthain). Close to *G. nepalense* Sweet and possibly only a form of that polymorphous species.

Distribution: Sumatra, Java, S.W. Celebes, Timor (*Forbes 3818*).

GESNERIACEAE

106. *Boea leporina* H. J.

Lam, nov. spec. — *Fig. 7* — *Suffrutex* c. 25 cm altus omnino corollis fructubusque exceptis dense lanuginosus. *Folia* praecipue in rosulas conferta sessilia decussata, lanceolato-oblonga integra, basin versus gradatim angustata, supra medium latiora, apice subacuta, vetustiora persistentia corrugata, in sicco grisea, juniora i. s. ut *Leporis europaei* aures utrinque albo-luteo lanuginosa, 5–6 cm longa, 1–1.3 cm lata, costa media crassa subtus prominens basi glabrescens. E medio rosulae caulis floriger erectus, foliis paulo latioribus plus minusve remotis. *Inflorescentia* terminalis in specimine unico 11 cm longa, 4–5 cm lata, paniculata, inflorescentiae partiales in foliorum gradatim decrescentium vel bractearum axillis racemosae vel rectius monochasiales. Pedicelli 0.2–0.3 cm longi. *Calyx* infundibuliformis c. 0.2 cm longus extus dense, intus sparsius pubescens, 5 lobis anguste triangularibus 0.13 cm longis. *Corolla* glabra obscure purpurea, zygomorpha, tubo c. 0.2 cm longo, lobis 4 rotundatis, c. 0.2 cm longis et diametro, uno (labio) c. duplo longiore omnibus aestivatione imbricatis. *Stamina* glabra 2, filamentis 0.2 cm longis sigmoideis in tubi dimidio sub labio inserta, antheris luteis late naviculi-

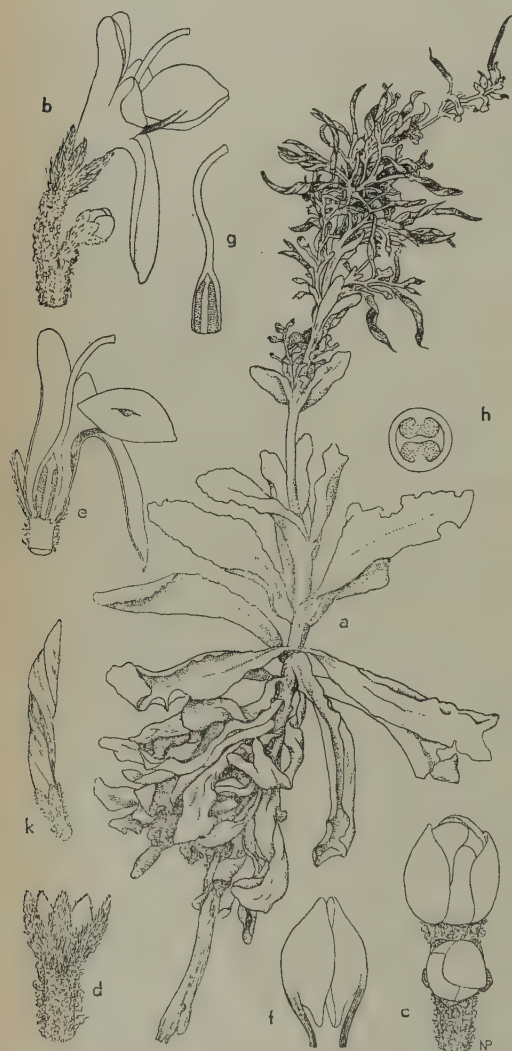


Fig. 7 — *Boea leporina* H. J. Lam, n. sp. — a. habit, $\times \frac{1}{2}$; b. tip of partial inflorescence with terminal flower open, lateral view, $\times 5$; c. ditto, front view, $\times 5$; d. calyx, $\times 5$; e. flower, longitudinal section, $\times 5$; f. androecium, $\times 5$; g. gynaecium, longitudinal section, $\times 5$; h. ditto, cross-section, $\times 10$; k. fruit, $\times 2$ — after type specimen.

formibus 0.3—0.35 cm longis 0.15 cm latis, planitiis cohaerentibus, apicibus plus minusve liberis. *Ovarium* glabrum oblongum uniloculatum 0.2 cm altum, duas placentas parietales adscendentes multiovulatas continens, in stylum 0.4 cm longum cylindricum solidum apice vix dilatatum truncatum ad antheras curvatum se applicantem contractum. *Fructus* capsularis glaber apice styli rudimento 0.2 cm longo ornatum, c. 1.3 cm longus, valvis valde tordatis.

Celebes: Central Celebes, Enrekang, west of Kalosi, on limestone rocks along road Kalosi-Makale, alt. 800 m (*C. Monod de Froideville* 401, type specimen, flow. dark purple, anthers yellow; L).

A species well distinguished from the other *Boea* species by its densely withish woolly leaves, reminding one of rabbit's ears (whence the specific name). As far as we could judge from a fragmentary specimen from Sarawak, Borneo (*Nat. coll.* 1373), this seems to be close to our species. However, the rosette is lacking and the specimen consists only of one large inflorescence, about 40 cm high and 11 across, the lateral branches dichasial and up to 14 cm long. The indumentum is quite that of *B. leporina* and also the flowers are very much alike, though the corolla is considerably larger (lip 0.7 cm long); their colour is unknown to me.

107. *Rhynchoglossum obliquum* Bl., Bijdr. 1826, 741.

Celebes: S.W. Celebes, Maros-Tjamba road, frequent in shady places on limestone, about 100 m alt. (*C. Monod de Froideville* 267, flow. blue and white; B, L).

According to Monod also found in Central Celebes and in the island of Boeton.

Distribution: India to Philippines and Moluccas.

GUTTIFERAE

108. *Hypericum Hookerianum* Wight & Arn., Prodr. Flor. Pen. Ind. or. 1834, 99.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, fairly abundant on open sunny summit, 2800 m (*C. Monod de Froideville* 227, erect shrub with drooping branches, flow., June 5—6, 1938; B, L).

Distribution: Himalaya, Java, Lombok, SW. Celebes.

HALORRHAGIDACEAE

109. *Halorrhagis scabra* (Koen.) Benth., Fl. Hongk. 1861, 139.

Var. *elongata* Schindl. in Engl. Pflanzenreich 23, 1905, 29.

Celebes: Lasao, 100 m (*Kjellberg* 1163, flow., 2.4.1929) — Central Celebes, Mamasa, 1000 m alt., sunny roadside, frequent (*C. Monod de Froideville* 259, erect herb, frequent on poor sandy grounds in the hills, flow. reddish; B, L).

Distribution of the species: India and S. China to New Guinea and Soemba; of the variety: S. China, Tonkin, Borneo, Philippines, Celebes, Soemba, Ceram.

LABIATAE

110. *Plectranthus Teysmanni* Miq., Fl. Ind. Bat. II, 1859, 944.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, sunny savannah, 1800 m alt., several specimens (*C. Monod de Froideville* 218, herb, about 1 m high, flow.

light coloured, June 5—6, 1938; B, L); Peak of Bonthain, 2300 m (*H. A. B. Bünnemeyer 11887*, flow., 7. 6. 1921); Lombasang, 950 m (*Id. 10947*, flow. 13. 4. 1921); Goa, Lembaja, 1600 m (*Neth. Ind. For. Serv. s.n.*, flow. 10. 5. 1936; B, L).

Possibly only a form of *P. rufescens* Benth. (1848) from Java.

Distribution: Java (particularly C. and E. Java), S.W. Celebes.

111. *Scutellaria luzonica* Rolfe, Journ. Linn. Soc. Bot. 21, 1884, 315.

Celebes: N. Celebes, Tondano, in coffee plantation (*Forsten 109*, flow., May 1840; L) — Central Celebes, Balokan, north of Makale, 1500 m alt., more or less shady places along road, some specimens (*C. Monod de Froideville 191*, small erect herb, about 10 cm high, flow. purple, A° 1938; B, L).

Distribution: Formosa (*Linsley Gressitt 441, 488*), Luzon, New Guinea; new for Celebes.

LENTIBULARIACEAE

112. *Utricularia orbiculata* Wall. Cat. 1829, n. 1500.

Celebes: Central Celebes, Mamasa, on wet dripping precipice, about 1000 m alt., locally very frequent (*C. Monod de Froideville 270*, flow. l. lilac with yellow, A° 1938; B, L).

Distribution: India and S. China to Philippines, Borneo and New Guinea. New for Celebes.

According to Monod also found in Todjamboe (nr. Palopo) and in S.W. Central Celebes, Lembango (Pinrang hills), but not in S.W. Celebes.

MELASTOMATACEAE

(R. C. Bakhuizen van den Brink)

113. *Sonerila celebica* Bakh. f., nov. spec. — *Fig. 8* — *Suffrutex* minime 20 cm altus. *Caulis* erectus teretiusculus glaber, juvenilis in siccitate rubro-fuscus. *Folia* herbacea decussata ejusdem paris valde inaequalia, majora ovato-lanceolata, basi subcordata apice acuta, marginibus grosse crenato-serrata breviter ciliata, ciliis 0.02—0.03 cm longis, utrinque glabra tri- vel subquintuplinervia, venulis inconspicuis, 2—2.8 cm longa, 0.9—1.2 cm lata, petiolo gracillimo glabro 0.6—1 cm longo; minora ovata vel elliptica vel suborbicularia 0.3—0.5 cm longa, 0.2—0.4 cm lata. *Flores* terminales 2—3 aggregati, pedicellis tenuibus glabris vel nonnullis pilis munitis, 0.7—0.8 cm longis. *Calycis* glabri tubus anguste obovatus costatus glaber, 0.35 cm longus, basi cuneatus apice subconstrictus, dentibus 3 triangularibus basi dilatatis c. 0.1 cm longis. *Petala* glabra (alba ?) 3 late obovata venulata obliqua apice obtusa undulata



Fig. 8 — *Sonerila celebica* Bakh. f., n. sp. — a. habit, $\times \frac{1}{2}$; b. leaf, nat. size; c. fruits, $\times \frac{1}{2}$ — after type specimen.

longiusecule acute acuminata 0.8 cm longa, 0.65 cm lata. *Stamina* 3 filamentis glabris 0.27 cm longis filiformibus, antheris luteis oblongis basi acute bilobis 2-poris 0.24 cm longis. *Stylus* glaber 0.7 cm longus, stigmate capitato. *Capsula* obpyramidalis glaber 0.5—0.6 cm longa.

Celebes: Central Celebes, Mt. Rante Karoea, north of Makale, in rain forest about 1800 m (*C. Monod de Froideville 202*, type specimen, L, A° 1938, flow. and fr.; B, L); Mt. Mamboeliling, north of Mamasa, in rain forest, about 2500 m, abundant (*Id. 171a*, A° 1938, fr.; B!, L).

Monod 171a, which was collected together with *n. 171* (*S. Froidevilleana*), differs from the type by having the branchlets and the petioles pretty densely, the leaves on either side sparsely pubescent. The flowers are sometimes solitary. There is little doubt that the specimen belongs to the present species, as it agrees with the type in all essential points available.

S. celebica seems to be most related to *S. tenuifolia* Bl. from Brit. Malaya, Sumatra, Bangka (?) and western Java, which differs from our species by its sagittate and acuminate anthers and non-venulose petals.

114. ***S. Froidevilleana*** Bakh.f., nov. spec. — *Fig. 9* — *Suffrutex* minime 10 cm altus. *Caulis* erectus teretiusculus pilis patentibus longis crispis rubro-fuscis minutus. *Folia* herbacea decussata, ejusdem paris aequalia vel subaequalia, ovata vel rarius ovato-oblonga, basi obtusa ad rotundata, apice obtusa, marginibus conferte grosse serrata longe ciliata, ciliis 0.1—0.2 cm longis, subtus in nervis sparse, supra densius pilis ad 0.3 cm longis ornata, 3-nervia, 0.9—1.8 cm longa, 0.6—1.1 cm lata, petiolo tenui sparse piloso 0.4—0.7 cm longo. *Flores* terminales solitarii vel bini, pedicellis glabris vel subglabris 0.7—0.8 cm longis. *Calycis* glabri tubus oblongo-triangularis basi angustatus 0.3 cm longus, dentibus 3 sinibus latis inter se separatis anguste triangularibus basi valde dilatatis 0.1—0.15 cm longis, extus pilis nonnullis vestitus. *Petala* glabra (alba ?) 3 obliqua late obovata apice late rotundata, undulata minutissime abrupte apiculata, 0.75 cm longa, 1 cm lata, vena media crassa ceterum avenia. *Stamina* 3, filamentis glabris 0.5 cm longis, antheris ovato-oblongis 1-poris 0.2 cm longis. *Stylus* glaber 1 cm longus, stigmate capitato. *Capsula* deest.



Fig. 9 — *Sonerila Froidevilleana* Bakh.f., n. sp. — a. habit, nat. size; b. leaf, lower side, $\times 2$ — after type specimen.

Celebes: Central Celebes, Mt. Mamboeliling, abundant in rain forest, 2500 m (*C. Monod de Froideville 171*, type specimen L, A° 1938, flow.; B, L).

This species shows no particular relation with any Malaysian species known to me. It differs from all other species from that region by its small, ovate acutely serrate and ciliate leaves and its broad obovate petals. With *S. celebica* (n. 171a) it shows some resemblance in the pubescence of the branchlets but the last-named specimen is easily distinguished by its obvious anisophylly, its different leaf margins and the characters of the flower. In its habit it recalls *Sarcopyramis delicata* Robins. (Sumatra and Philippines) which differs, however, among other characters, by its 4-merous flowers.

Thusfar only two *Sonerila*-species were known from Celebes, viz. *S. brachyandra* Naud. from S.W. Celebes (Lombosang) and the Philippines and *S. laeviuscula* Zoll. & Mor. var. *grandifolia* Cogn. The latter variety is unknown to me, but both species are undoubtedly quite different from either species described above (cf. Rec. Trav. bot. néerl. XL, 1943 = Med. Bot. Mus. en Herb. Rijksuniv. Utrecht n. 91).

MYRTACEAE

115. *Leptospermum flavescens* Sm., Transact. Linn. Soc. 3, 1797, 262.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, subalpine elfin woodland, 2900 m (*C. Monod de Froideville 231*, small tree, dominating the woody flora of the summit, flow. white, June 5—6, 1938; B, L).

Distribution: Burma to Australia.

NEPENTHACEAE

116. *Nepenthes tentaculata* Hook.f. in DC., Prodr. XVII, 1873, 101; Danser, Bull. Jard. bot. Buitenz., Sér. III, Vol. IX, 1928, 379, 428.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, 2700 m, fairly abundant in subalpine bush (*C. Monod de Froideville 117*, sterile, rosettes only; B, L).

Although sterile, probably this species.

Distribution: Borneo, S.W. Celebes. New for C. Celebes.

PIPERACEAE

117. *Peperomia reflexa* (L.f.) A. Dietr., Sp. Pl. 1, 1831, 180.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, in mountain forest, 2000 m alt., rather frequent (*C. Monod de Froideville 222*, flow. June 5—6, 1938; B, L).

Distribution: pantropical.

PLANTAGINACEAE

118. *Plantago major* L., Sp. Pl., 1753, 113.

Celebes: S.W. Celebes, Loka, 1000 m alt., abundant (*C. Monod de Froideville 388*, A° 1938).

Distribution: occasional in waste places, at medium altitudes naturalized, introduced from Europe.

POLYGALACEAE

119. *Polygala chinensis* L., Sp. Pl., 1753, 704.

Celebes: S.W. Celebes, "Tempe-depression", Sengkang, Siwa, about 50 m alt., abundant in grass vegetation (*C. Monod de Froideville* 284, small herb, flow. bright blue; B, L) — C. Celebes, west of Palopo (*Id.* 471; L).

Distribution: India and China to tropical Australia.

120. *P. longifolia* Poir. in Lamk., Encycl. 5, 1904, 501.

Celebes: S.W. Celebes, "Tempe-depression", Sengkang, Siwa, about 50 m alt., fairly frequent in grass vegetation (*C. Monod de Froideville* 283, erect herb, flow. white; B, L).

Distribution: India and Indo China to tropical Australia.

121. *P. paniculata* L., Syst. Nat. Ed. X, 1759, 1154.

Celebes: S.W. Celebes, Bonthain, Loka, about 800 m, frequent in sunny places on poor soil (*C. Monod de Froideville* 367, flow. white, rarely somewhat purple, roots fragrant; L).

Distribution: a native of Brasil, occasionally introduced into other tropical countries, in Malaysia thusfar known from (Coll. Rijksherbarium only) Sumatra, Java (especially western Java) and S.W. Celebes and also from the Solomons (Ysabel Isl.). According to Monod also a common weed in the hills of Central Celebes.

122. *Salomonina cantoniensis* Lour., Fl. Cochinch., 1790, 14.

Celebes: S.W. Celebes, along road Bonthain-Loka, about 800 m alt., in sunny places also on poor soil (*C. Monod de Froideville* 363, flow. purple and white; L).

Distribution: India and S. China to tropical Australia.

POLYGONACEAE

123. *Polygonum minus* Huds., Fl. angl. Ed. 1, 1762, 1; Danser, Bull. Jard. bot. Buitenz. Sér. III, Vol. VIII, 1927, 174.

Subsp. *decipiens* (R. Br.) Dans., l.c. 178.

Celebes: Central Celebes, Balokan, north of Makale, in partly cleared forest near resthouse, abundant (*C. Monod de Froideville* 185, A° 1939, flow. white, fr. bluish; B, L).

Distribution of the species: Europe, Asia to Australia; of the subspecies: New Guinea, Australia; new for Celebes.

PRIMULACEAE

124. *Lysimachia japonica* Thunb., Fl. Jap. 1784, 83.

Celebes: Central Celebes, Balokan, north of Makale, 1500 m alt., roadside, several specimens (*C. Monod de Froideville* 201, A° 1938, procumbent herb, flow. yellow; B, L).

Distribution: India, China and Japan to Sumatra and Java, also in N. Australia (introduced ?). Apparently new for Celebes.

RANUNCULACEAE

125. *Ranunculus diffusus* DC., Prodr. I, 1824, 38.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, open vegetation on summit, 2900 m, some specimens (*C. Monod de Froideville* 384, flow., June 5—6, 1938; L).

Distribution: Himalaya, Assam, Malay Peninsula, Sumatra, Java, S.E. Celebes (Roembia: *Elbert 3042*), Lombok. Apparently new for S.W. Celebes.

126. *Ranunculus Frigidurbis* H. J. Lam, nov. spec. — *Fig. 10* — *Herba* cauli brevissimo. *Folia* rosulam formantia, petioli teretes 3—4 cm longi, cum petiolulis dense adpresse pilosi, pilis 0.1—0.15 cm longis, lamina ambitu cordata 1.5—1.9 cm longa, 1.1—1.7 cm lata trifoliolata, petioluli laterales 0.1—0.4 cm, terminales 0.3—0.7 cm longi, foliola papyracea supra sparse subtus densius pilis 0.1—0.15 cm longis vestita, omnia



Fig. 10 — *Ranunculus Frigidurbis* H. J. Lam, n. sp. — a. habit, $\times \frac{3}{4}$; b. leaf, $\times 2$; c. flower without petals, $\times 5$; d. stamen, $\times 10$; e. follicle, $\times 5$ — after type specimen.

plerumque triloba ad trifida lobulorum marginibus interdum semel emarginatis plerumque integris, apicibus late ogivalibus vel saepius rotundatis, lateralia paulo obliqua, omnia basi late subcordata vel rotundata, 0.7—1.2 cm. longa, 0.8—1.0 cm lata. *Flores* solitarii longopedicellati, pedicelli teretes longiuscule adpresse pilosi 7—8 cm longi, perianthio in specimine unico delapso ex collectoris annotationibus luteo. *Stamina* glabra c. 0.35 cm longa, filamenta vittiformia marginibus hyalinis vasculis opacis c. 0.25 cm longa, 0.02—0.04 cm lata, antheris 0.1 cm longis, 0.05 cm latis oblongis. *Gynaeceum* 0.3 cm longum, carpella c. 17 in flore vetustiori erecta glabra ovata apicem versus sensim acutata stylo demum vix,

deinde paulo, ultimam valde rigide unciformiter recurvato. *Folliculi* circulares 0.25 cm diametro, stylo rigide recurvato 0.05 cm longo.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Bawa Kraeng, 2500 m, near origin of rivulet in the saddle between the two tops in grassy and moist, somewhat shady places, several specimens (*C. Monod de Froideville 209*, type specimen L, flow. yellow, A° 1937; B, L).

Apparently related to *R. diffusus* DC. but distinctly different by the small, few-lobed leaves and the strikingly rounded leaf-lobes.

The Sarasin's mention from the same locality *R. Sarasinorum* Warb., a species which, however, has probably never been properly described. I do not know whether it is conspecific with our species.

I deem it a privilege to name this species in honour of Mr Monod de Froideville, who is one of those botanical amateurs whose interest and

keen gift of observation have felicitously enriched botanical science with many valuable data.

ROSACEAE

127. *Potentilla papuana* Focke, Abh. Nat. Wiss. Ver. Bremen XIII, 1896, 162; Th. Wolf, Bibl. Bot. XVI, Heft 71, 1908, 678.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Bawa Kraeng, abundant in open rocky places, about 2500 m (*C. Monod de Froideville* 210, creeping stoloniferous herb with yellow flowers, A° 1937; B, L).

The specimen is rather poor, but sufficient to allow an identification. The erect branches bear two flowers, the petals of which do hardly exsert from the calyx. The carpels are perfectly glabrous. These characters show that the specimen cannot belong to *P. leuconota* D. Don (Himalaya to Yunnan), a name often given without much critical sense to all Malaysian *Potentillae*. The differences between the two species which, with *P. peduncularis* Don (Himalaya to Yunnan) and a few others, form a group of closely related species, are clearly pointed out by Focke. The above-quoted specimen agrees in all essential points with Focke's description (material was not available) but in that the style is rather long and slender (0.075 cm). The rosette leaves are 8–10-pinnate and the leaflets have about 6 teeth on either side. This is the first record of *P. papuana* outside New Guinea.

P. leuconota D. Don var. *borneensis* Stapf from Mt. Kinabalu superficially resembles the present species. The latter is, however, distinctly different by the hardly or not exsert petals and the glabrous carpels. In a specimen of the Borneo variety of *P. leuconota*, collected by J. & M. S. Clemens (n. 26958) the petals are much exsert and the carpels erectly pilose at the top. This variety is undoubtedly, as has already been stated by J. D. Hooker, intermediate between *P. papuana* and the type of *P. leuconota*; the latter has the flowers aggregated to pseudo-umbels of at least 7 flowers.

Distribution: New Guinea, Celebes.

RUBIACEAE

(C. E. B. Bremekamp)

128. *Argostemma solaniflorum* Elm., Leafl. Phil. Bot. I, 1906, 2.

Celebes: Central Celebes, Mt. Mamboeliling, in mountain forest about 2500 m (*C. Monod de Froideville* 474; L).

Close to *A. montanum* Bl. from western Malaysia.

Distribution: Philippines except the Islands of the Palawan group. First record outside the Philippines proper.

129. *Hedyotis benguetensis* (Elm.) Elm., Leafl. Phil. Bot. III, 1911, 976.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang (*C. Monod de Froideville* 256, small shrub, about 1 m high, flow. white or pale lilac, June 5–6, 1938; B, L).

Perhaps identical with the long-styled form described by Elmer

in Leaf. Phil. Bot. I, 1906, 18 (sub *Oldenlandia benguetensis* Elm.).

Distribution: Luzon.

130. *Hedyotis* (*Diplophragma*) *coryphocetes* Brem., nov. spec.; *typus*: *Monod de Froideville* 230 (L); cymis terminalibus et axillaribus, corolla satis magna, extus glabra, tubo campanulato, lobis intus dense villosis ad *H. Elmeri* Merr. accedens, foliis multo minoribus utroque latere costa nervis 2 instructis, stipulis anguste triangularibus, cymis trifloris ab ea facilliter distinguenda.

Frutex circ. 1.25 m altus. *Rami* leviter quadricostati, glabri. *Folia* sessilia, basi tamen in pseudopetiolum alatum, 1.5—3 mm longum contracta, supra pseudopetiolum ovato-lanceolata, 2—3 cm longa et 7.5—10 mm lata apice acuta, coriacea, sicc. supra fucescens vel nigrescens, subtus dilute olivaceo-brunnea vel luteo-brunnea, supra glabra, subtus praesertim costa pilis paucis sparsa, nervis utroque latere costae 2, nervis infimis e basi, alteris prope basin partis ovato-lanceolatae orientibus, supra immersis, subtus prominulis, venulis subtus conspicuis. *Stipulae* anguste triangulares, 7.5 mm longae, basi 2.5 mm latae, extus intusque glabrae et raphidibus lineolatae, utroque latere appendicibus 7—8 capitatis, apicem versus longioribus instructae. *Inflorescentiae* cymosae, triflorae, terminales et axillares, in thyrsos 15-floros compositae. *Pedunculi* cymarum glabri, cymae terminalis 4—6 mm, aliarum usque ad 12 mm longi. *Braectae* florum lateralium lineari-lanceolatae, 9.5—12 mm longae et 1.5 mm latae, stipulis munitae; stipulae longitudine redactae, bifidae, bipartitae vel disjunctae, extus ad basin hirsutae, appendicibus paucioribus sed longioribus instructae. *Flores* pedicellati, ebracteolati, 4-meri. *Pedicellus* floris terminalis 2 mm, pedicelli florum lateralium 3.5 mm longi, glabri. *Ovarium* turbinatum 2 mm altum, glabrum, biloculare, utroque loculo ad medium septum placenta carnosa ovulis numerosis obtecta instructo. *Calyx* fere usque ad basin partitus, extus intusque glaber; lobi triangulares 6 mm longi et basi 1.5 mm lati, raphidibus lineolati, sinubus acutis separati et cum glandulis baculiformibus alternantes. *Corolla* dilute coerulea, extus glabra, tubus campanulatus 4 mm longus, intus glaber, lobi ovati patentes 4 mm longi et basi 3 mm lati, intus pilis unicellularibus subelavatis dense villosi. *Stamina* paulo infra incisuras corollae inserta; filamenta glabra, floris longistyli 0.8 mm longa; antherae oblongae, 1.7 mm longae. Discus vix conspicuus. *Stylus* glaber, floris longistyli 6 mm longus; stigmata appressa, semi-ovoida, 0.5 mm longa. *Fructus* dicoecus, calyce coronatus; cocci 4 mm longi, facie interna dehiscentes, seminibus circ. 10 instructi. Semina brunnea, angulosa, 1 mm diam., alveolata — *Fig. 11*.

Habitat regionem altissimam terrae celebicae australis.

Celebes: S.W. Celebes, Peak of Bonthain, G. Lompobatang, on the top of the mountain in an association of grass and shrublets, alt. 2900 m (*C. Monod de Froideville* 230, type specimen, L; B, L).

On account of our imperfect knowledge of the genus *Hedyotis* the position of the new species is difficult to determine. Regarding the structure of the fruit it is to be referred to the subgenus *Diplophragma*, which, however, is but vaguely distinct from *Dimetia*, the main differential character — the presence or absence of a conical top on the fruit — being unreliable. The various species referred to *Diplophragma*, on the other

hand, differ widely in the position of the inflorescences, which may be combined in a terminal thyrses or panicle or be confined to the axils of the leaves, in the presence or absence of hairs on the inside of the corolla lobes, and in the structure of the stipules. It is not impossible that a satisfactory classification of the species may be based on these characters, but they are at present not yet sufficiently known to be of much use. However, the only other species with terminal inflorescences and inside villous corolla lobes known at present appear to be the Philippine *H. Elmeri* Merr., *H. microphylla* Merr. and *H. benguetensis* Elm. The latter is a plant which is now known both from the mountains of the Philippines and of Celebes, but it is not impossible that *H. Maingayi* Hook.f. from Mt. Ophir in Malacca too may belong to this group: unfortunately the description makes no mention of the presence or absence of hairs on the corolla lobes. That *H. Maingayi* can not be conspecific with the plant collected on the Peak of Bonthain follows from the structure of the stipules, which are described as entire and eglandular. *H. benguetensis* has thinner leaves, entirely different stipules and much smaller flowers, and *H. Elmeri*, which doubtless comes nearer to our new species, has much larger leaves with 5 or 6 pairs of nerves and larger inflorescences.

Inside villous corolla lobes are more common in *Diplophragma*-species provided with axillary inflorescences. Examples are *H. pulchella* Stapf, a plant collected on Mt. Kinabalu, which, apart from the position of the inflorescences, shows a remarkable degree of similarity with *H. benguetensis*, and further some Philippine species like *H. apoensis* Elm. and *H. Banksii* Elm.

131. ***H. verticillata*** (L.) Lamk., Ill. Gen. I, 1791, 271.

Celebes: Central Celebes, sunny places along road Sengkang-Palopo, about 20 m alt., fairly abundant (C. Monod de Froideville 280, procumbent herb with stiff stems, leaves shining and rigid; B, L).

Distribution: India and S. China to Philippines and Malaysia.

132. ***Knoxia corymbosa*** Willd., Sp. Pl. I, 1797, 582.

Celebes: Central Celebes, sunny places on fertile soil along road Sengkang-Palopo, low alt., some specimens (C. Monod de Froideville 266, erect herb, about 1 m high, flow. white; B, L).

Most specimens from the Netherlands Indies, commonly attributed to *K. corymbosa*, had probably better be kept separate under the name of *K. lineata* R. Br., which at present is often considered a subspecies to *corymbosa* but which probably deserves specific rank.



Fig. 11 — *Hedyotis coryphocetes* Brem., n. sp. — a. habit, nat. size; b. stipules, nat. size; c. flower, $\times 2$; d. stamen, $\times 3$ — after type specimen.

Distribution: India and China to tropical Australia. The distribution of the subspecies is not exactly known.

133. *Nertera depressa* Banks & Sol. ex. Gaertn., Fruct. et Sem. Pl. I, 1788, 124.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, about 2000 m, in mountain forest (*C. Monod de Froideville* 129, creeping herb, fr. bright red, A° 1938; B, L).

Distribution: Sumatra, Java, Borneo, Celebes, Philippines, Australia, New Zealand, South America.

134. *Oldenlandia subulata* Korth., Ned. Kruidk. Arch. II, 2, 1851, 153; Miquel, Fl. Ind. bat. II, 1857, 188 and 353; Boerlage, Handl. Fl. Ned. Ind. II², 1899, 125 — *O. Horneriana* Miq., Fl. Ind. Bat. II, 1857, 190 and Suppl. 1860, 217 and 540 — (non *O. subulata* Korth. apud Valetton in Nova Guinea VIII³, 1911, 440, quae est "*O. herbacea* L." herb.).

Celebes: S.W. Celebes, "Tempe depression", alt. about 50 m, Sengkang, nr. Siwa, in grass vegetation, in wet season with many swampy places (*C. Monod de Froideville* 399, A° 1939, flow. and fr.; B, L).

Undoubtedly closely allied to the common weed known under the name of *Oldenlandia herbacea* (L.) Lamk. as well as to *O. Heynii* (R. Br.) Miq. (India to Burma), *O. dichotoma* Koen. (India and Brit. Malaya), probably also to *O. pusilla* Rottl. (syn. *O. brachiata* Wight) from India, with which Miquel associates his *O. Horneriana*. "*O. herbacea*"¹) is a flaccid, procumbent plant with subterete stems; *O. Heynii* is stiffly erect and has sharply quadrangular stems and leaves which turn black in drying. *O. subulata* is likewise erect and possesses four-ribbed stems, but the leaves are rigid and somewhat rough and the pedicels are densely covered by minute warts.

Distribution: Sumatra, Java, Borneo, S.W. Celebes.

135. *Ophiorrhiza nerterifolia* Brem., nov. spec.; *typus*: *Monod de Froideville* 194, L; inter species paucas uni- vel bifloras ad *O. perpusillam* Bl. accedens, caulibus sulcis solis hirtellis, foliis ovatis coriaceis, sicc. nigrescentibus, corolla majore ab ea distinguenda.

Herba ramosa parva, ramis e basi repente ascendentibus. *Rami* graciles, 0.5 mm diam., sicc. nigrescentes, internodia 0.5—2 cm longa, bisulcata; sulci pilis curvis hirtelli. *Folia* petiolo glabro, circ. 1 mm longo instructa; lamina ovata, 6—9 mm longa et 4.5—5 mm lata, apice acuta, coriacea, supra sicc. nigrescens, subtus albidia, costa nervisque tamen roseis, margine incrassata, supra apicem versus et praesertim ad marginem pilis paucis sparsa, subtus glabra, nervis utroque latere costae 3—5. *Stipulae* indivisae, filiformes, 2.5 mm longae, glabrae, ad basin margine et facie interiore glandulis aliquibus clavatis instructae. *Inflorescentiae* terminales solum, uni- vel biflorae. *Pedunculus* et *pedicellus* vix diversi, papilloso, plerumque bracteis filiformibus una vel duabus, usque ad 1.5 mm longis instructi, conjunctim usque ad 5 mm longi; *pedicelli* inflorescentiarum biflorarum inaequilongi, longiores usque ad 3 mm longi. *Bracteolae* nullae. *Ovarium* papillosum, 1.5 mm altum et 1.3 mm latum. *Calycis* lobi triangulares,

¹) The name *O. herbacea* is not quite certain; see Trimen's remarks (Handb. Fl. of Ceyl.) on the type specimen in Hermann's herbarium.

1.2 mm longi, carinati, carina labri, ceterum papilloso, sinubus obtusis separati, alternantes cum glandulis clavatis. *Corolla* alba, extus glabra; tubus 5—6 mm longus, basi 1 mm diam., sed ad orem subito usque ad 2.5 mm diam. ampliatus, intus ad basin glaber, ceterum dense et longe sericeo-villosus, lobi triangulares 2.5 mm longi, basi 1.2 mm lati, intus pilis marginem versus longioribus papilloso. *Stamina* 0.7 mm supra basin tubi inserta; filamenta glabra 1.4 mm longa; antherae lineares 1.4 mm longae, basi breviter bilobatae. Granula pollinis carunculata. *Discus* conicus, 0.3 mm altus, bipartitus. *Stylus* glaber 3.3 mm longus; stigmata linearia styli vix crassiora 1.7 mm longa, appressa. *Fructus* 7 mm latus, 2.5 mm altus, lobis calycis coronatus, glabrescens. Semina luteo-brunnea angulosa alveolata 0.4 mm diam., numerosa — *Fig. 12.*



Fig. 12 — *Ophiorrhiza nerterifolia* Brem., n. sp. — a. habit, nat. size; b. leaves and stipules, $\times 2$ — after type specimen.

Habitat terram celebicam.

Celebes: Central Celebes, Makale, Rante Karoea, north of Makale, along road in coffee plantation of Mr van Dijk, alt. 1600 m, abundant (C. Monod de Froideville 194, L, type specimen, creeping herb, flow. white; B, L).

Ophiorrhiza-species with one or two flowers per inflorescence are comparatively rare and apparently confined to the eastern part of the Malay Archipelago. The plant described above resembles *O. perpusilla* Bl., of which the type was collected in Ternate, but which according to Miquel occurs also in Lombok, not however, as stated in De Candolle's monograph, in Java. *O. biflora* Elm. from Negros and Mindanao is but doubtfully distinct from *O. perpusilla* Bl. Another related species is *O. linearifolia* Merr. from Basilan, but this is a much larger plant with linear leaves and very small flowers.

SCROPHULARIACEAE

136. *Adenosma bilabiatum* (Roxb.) Merr., Enum. Phil. Flow. Pl. 3, 1923, 434.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, about 2500 m (*C. Monod de Froideville 241*, erect herb, flow. purple, June 5—6, 1938; B, L).

Distribution: India to Philippines and Malaysia (Herb. Lugd. Bat.: Bangka, Borneo, Amboina).

137. *Buchnera urticifolia* R. Br., Prodr. 1810, 437; Merrill, Enum. Phil. Flow. Pl. 3, 1923, 442.

Var. α *typica* H. J. Lam, nov. var. — Planta omnis plus minusve dense minute pubescens.

In the collections of the Rijksherbarium represented from Sumatra, Java, Timor, Soemba, Amboina, Boeroe, Thursday Isl., S. New Guinea, Australia.

Var. β *glaberrima* H. J. Lam, nov. var. — Planta marginibus bractearum paulo pubescentibus exceptis omnis glaberrima.

Lesser Sunda Islands: Lombok, Sembalang, Mt. Rindjani, 1300 m. alt. (*De Voogd 2078*, flow., 12.6.1933; B, L).

Celebes: S.W. Celebes, G. Gelosong nr. Malino, about 310 m alt. (*H. A. B. Bünnemeyer 10809*, type specimen of the var., flow. 5.4.1921; B, L); Bontoparang, about 50 m alt. (*Id. 10687*, flow. 29.3.1921; B, L); Boeloeparigi nr. Tanette, about 560 m alt. (*Id. 12464*, flow. 27.6.1921; B, L); in the hills of S.W. Celebes, frequent but scattered in grassland and cattle ground (*C. Monod de Froideville 290*, erect herb, flow. pink; B, L) — Central Celebes, Palopo, nr. Pareman, fairly abundant in rocky grassland, 100—150 m alt. (*Id. 289*, erect herb, up to 40 cm high, flow. white; B, L).

Philippines: Luzon (*Ramos & Edaño 44766*, Nov.-Dec. 1922); Culion (*Lopez 41354*, Oct. 1922).

The two varieties seem to be fairly distinct. Merrill (l.c.) combines with the present species R. Brown's *B. gracilis*, var. ? *glabrior* Benth. (in DC., Prodr. 10, 1846, 497) from the Philippines, and the distribution is indicated as tropical Australia and Philippines, but it is not clear which of the two varieties described above is meant. In spite of its name, *B. gracilis* var. *glabrior* should be distinguished by a slightly longer corolla. Now, *Monod* indicates for his nr. 290: flowers pink and smaller than those of n. 289 (in which the flowers are white). In fact, in n. 290 the corolla's are 0.8 cm long and the limbs 0.4 cm broad, in n. 289 these dimensions are 1 and 0.6 cm respectively. Of the other specimens quoted above, only *Bünnemeyer 10809* shows the larger flower type, all others have small flowers. The same homologous variation is found in var. α ; of the 20 specimens at hand 4 showed the larger flower type (which is apparently the rarer one), but 2 others were more or less intermediate or showed small-flowered plants intermixed with larger-flowered ones on the same sheet. I therefore prefer to restrict myself to draw the attention to these points and to leave it to further examination whether these differences will appear sufficiently clear to allow the creation of homologous forms in either variety and whether they are coordinated with the two colours, pink and white, mentioned by *Monod de Froideville*. The specimens of both varieties turn black when dried.

138. *Limnophila chinensis* (Osb.) Merr., Am. Journ. Bot. 3, 1916, 581.

Celebes: Central Celebes, Palopo, Balokan, north of Makale, 1500 m alt., abundant on fallow wet paddy field (*C. Monod de Froideville 186*, erect herb, about 75 cm high, flow. pink, A° 1938; B, L).

Distribution: India and S. China to Java, Celebes and the Philippines.

139. **Lindernia cordifolia** (Colsm.) Merr., Enum. Phil. Flow. Pl. 3, 1923, 437.

Celebes: Central Celebes, Palopo, Balokan, north of Makale, 1500 m alt. (*C. Monod de Froideville* 207 and 208, A° 1938; B, L).

Previously collected in S.W. Celebes by H. A. B. Bünнемeyer (ns. 11907, 12047 and 12385).

Distribution: India and China to Philippines, Celebes and Java.

140. **Razumovia cochinchinensis** (Lour.) Merr., Bull. Torr. Bot. Club 64, 1937, 594.

Celebes: S.W. Celebes, "Tempe-depression", grassland, in wet sason with many inundated places, about 50 m alt., fairly abundant (*C. Monod de Froideville* 281, erect herb, about 60 cm high; B, L).

Distribution: India to China and Japan, Formosa, Philippines, Sumatra, Java, Madoera, with a variety in India to China and another in Australia. The Celebes record is new.

UMBELLIFERAE

141. **Hydrocotyle sibthorpioides** Lamk., Enc. méth., bot. 3, 1789, 153; Buwalda, *Blumea* II³, 1936, 128.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, frequent in open subalpine vegetation on summit, 2900 m (*C. Monod de Froideville* 248 and 249, creeping herb, flow. June 5—6, 1938; B, L).

Distribution: Tropical Asia to Philippines and New Guinea; also in S. America?

142. **Sanicula europaea** L., Sp. Pl., 1753, 235; Buwalda, l.c., 159.

Celebes: Central Celebes, Mt. Rante Karoea, north of Makale, 2000 m alt., abundant in mountain forest (*C. Monod de Froideville* 178, flow. A° 1938; B, L).

Distribution: Europe to Japan, southward to the mountains of Africa, India and Malaysia to Mindanao, Celebes, Ceram and Timor.

143. **Trachymene celebica** Hemsl., Kew Bull., 1896, 37; Buwalda, l.c., 149.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, fairly abundant in open subalpine vegetation of summit, 2700—2800 m alt. (*C. Monod de Froideville* 235, flow. June 5—6, 1938; B, L).

Distribution: endemic (S.W. Celebes). Of this chiefly Papuan genus 6 species are known from Celebes, the northernmost locality is the Poanaa Mountains in Central Celebes. Four of these six species are endemic.

URTICACEAE

(G. J. H. Amshoff)

144. **Chamabainia cuspidata** Wight, Icon. 6, 1853, 11, t. 1981; Robinson, Phil. Journ. Sci. 6, 1911, 11 — *Urtica squamigera* Wall., Cat. 1831, n. 4592, nom. nud. — *Chamabainia squamigera* Wedd. in DC., Prodr. 16¹, 1869, 218; Merrill, Phil. Journ. Sci. I, 1906, 184.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, on open summit between grasses, 2700 m (*C. Monod de Froideville* 247, June 5—6, 1938, flow.; B, L).

This species deceivingly resembles *Droguetia pauciflora* (Rich.) Wedd. (Abyssinia, India, Java) and also, but less strikingly, *Pilea Wightii* Wedd.;

from both it is distinguished by the quite different flowers. It represents the first record of the species in the Netherlands Indies.

Distribution: India and Ceylon to S.W. China, Luzon, Mindanao, Celebes, on higher mountains.

145. *Elatostema delicatulum* Wedd. in Ann. Sc. Nat. 4e Sér. I, 1854, 190; DC., Prodr. 16¹, 1869, 187; Robinson in Phil. Journ. Sci. 5, 1910, 520 — *E. obtusum* Wedd., var. *delicatulum* Wedd. in DC., Prodr. l. c.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, abundant in mountain forest, 2000 m (*C. Monod de Froideville* 223, ♀, June 5—6, 1938; B, L).

The synonymy and, consequently, the distribution is not fully clear. According to Robinson, *E. delicatulum* is endemic in the Philippines, differing from the closely related *E. obtusum* Wedd. by the short-stalked, less pubescent capitula. The above specimen fully agrees with the Philippine specimens in its sessile, much and silverish pubescent capitula. *E. obtusum* is said to occur in the Himalaya (t. Weddell; cf. also H. Schroeter in Fedde's Rep. Beih. 83, 1935, 30—34), and Merrill (Enum. Phil. Flow. Pl. II, 1923, 80) mentions *E. obtusum* Wedd. only "quoad Phil.". If *E. obtusum* and *delicatulum* should prove to be synonymous, the latter name is the valid one as has been observed by Robinson, since *obtusum* is of 1856 (Arch. Mus. Par. 9, 1856, 324).

VIOLACEAE

(with S. J. van Ooststroom)

146. *Viola arcuata* Bl., Bijdr. 1825, 58.

Celebes: Central Celebes, Mt. Mamboeliling, north of Mamasa, in mountain forest, about 2000 m alt. (*C. Monod de Froideville* 131, stoloniferous herb, flow. white with dark purple delineation, A° 1938; B, L).

Distribution: India to southern China southward to Luzon, Celebes and Java.

147. *V. betonicifolia* Sm. in Rees, Cycl. 37, 1819, n. 7.

Subsp. *nepalensis* (Ging.) W. Beck., Engl. bot. Jahrb. 54, 1917, Beibl. 120.

Celebes: S.W. Celebes, Loka, on slope of Mt. Lompobatang (Peak of Bonthain), along road nr. resthouse, 1000 m alt. (*C. Monod de Froideville* 217, fr., June 5—6, 1939 [recte 1938 ?], often [certain parts of the year ?] only cleistogamous; B, L) — Central Celebes, Balokan, north of Makale, some specimens on premises of resthouse, 1500 m alt. (*C. Monod de Froideville* 363, flow., A° 1939; L).

Undoubtedly very close to *V. inconspicua* Bl. from India to China, Formosa, Philippines, Brit. Malaya, Borneo, Java and Sumatra, with the type of which (Bl. in Herb. Lugd. Bat.!) it seems to be connected by a series of intermediate forms. In the specimens quoted the leaves are long and narrow, about 4.5 cm long, 2 cm broad across the subsagittate base. For *n. 217* cleistogamy is indicated, a character well known in *V. inconspicua*.

Distribution of the subspecies: India and Ceylon to China and Japan, Formosa, Philippines, Celebes, Timor, Java. The other subspecies (*australensis* W. Beck, l. c.) in eastern and southern Australia and Tasmania.

148. *V. serpens* Wall. in Roxb., Fl. Ind. ed. Carey II, 1832, 449.

Celebes: S.W. Celebes, Peak of Bonthain, Mt. Lompobatang, 1600 m alt. (*C. Monod de Froideville* 245, flow., June 5—6, 1938; B, L); Kanreapia forest nr. Malino, about 1200 m alt., some specimens along shady trail (*Id.* 397, flow. & fr., A° 1939; L).

Distribution: India to China, Sumatra, Java, Lesser Sunda Islands (1 specimen in Herb. Lugd. Bat. without further indication of locality, collected by *De Voogd* n. 1852, 14.10.1934; possibly from Bali). New for Celebes.

Discussion on the Collection Monod de Froideville.

Of the collection Monod de Froideville 148 species were identified; 117 of these were represented by specimens, 31 by pictures.

The following is an enumeration of new taxa:

New species (13):

- Asplenium Psychropolitanum* H. J. Lam et C. J. Verhey (Polypod.)
- Boea leporina* H. J. Lam (Gesner.)
- Bulbophyllum falculicorne* J. J. S. (Orchid.)
- Dendrochilum Monodii* J. J. S. (Orchid.)
- Elaphoglossum pumilum* H. J. Lam et C. J. Verhey (Polypod.)
- Gentiana uncifolia* H. J. Lam (Gentian.)
- Hedyotis coryphocetes* Brem. (Rubiace.)
- Microstylis mambulilingensis* J. J. S. (Orchid.)
- Ophiorrhiza nerterifolia* Brem. (Rubiace.)
- Ranunculus Frigidurbis* H. J. Lam (Ranunc.)
- Sonerila celebica* Bakh.f. (Melastom.)
- Sonerila Froidevilleana* Bakh.f. (Melastom.)
- Strophacanthus celebicus* Brem. (Acanth.)

New variety (1):

- Buchnera urticifolia* R. Br., var. *glaberrima* H. J. Lam (Scroph.)

New form (1):

- Rhododendron quadrasianum* Vid., fa. *Monodii* H. J. Lam (Ericac.)

New combinations (6):

- Trochocarpa celebica* (J. J. S.) H. J. Lam
- " *DeKockii* (J. J. S.) H. J. Lam
- " *Gjellerupii* (J. J. S.) H. J. Lam
- " *Learmonthiana* (Gibbs) H. J. Lam
- " *nutans* (J. J. S.) H. J. Lam
- " *Vannouhuysii* (J. J. S.) H. J. Lam

In addition, the following species etc. are probably new for the Celebes flora (20):

- Argostemma solaniflorum* Elm. (Solan.)
- Bulbophyllum macranthum* Lindl. (Orchid.)
- Cerastium indicum* W. et A. (Caryoph.)
- Chamabainia cuspidata* Wight (Urtic.)
- Cynoglossum micranthum* Desf. (Borag.)
- Dipteris novo-guineensis* Posth. (Polypod.)
- Elatostema delicatulum* Wedd. (Urtic.)
- Eulophia exaltata* Rehb.f. (Orchid.)

Hedyotis benguetensis (Elm.) Elm. (Rubiaceae)
Lycopodium clavatum L., var. *tamariscispica* Ces. (Lycop.)
Lysimachia japonica Thunb. (Primul.)
Polygonum minus Huds., subsp. *decipiens* (R. Br.) Dans. (Polygon.)
Potentilla papuana Focke (Rosac.)
Pratia nummularia (Lamk.) Kurz. (Campan.)
Razumovia cochinchinensis (Lour.) Merr. (Scroph.)
Scutellaria luzonica Rolfe (Lab.)
Selaginella singalanensis Hieron. (Selaginell.)
Utricularia orbiculata Wall. (Lentib.)
Viola serpens Wall. (Violac.)
Weinmannia urdanetensis Elm. (Cunon.)

Collectors' numbers

The species have been referred to by their consecutive number:

- BACKER, C. A. — 9725 (98).
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 BÜNNEMEYER, H. A. B. — 10687 (137); 10809 (137); 10853 (6); 10947 (110);
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 11907 (139); 12064 (78); 12184 (93); 12223 (96); 12250 (96); 12254 (93);
 12385 (139); 12464 (137).
 CARR, C. E. — 14415 (17).
 CLEMENS, J. & M. S. — 27097 (93); 27097 B (93); 27474 (80); 27779 (93);
 27912 (96); 28956 (94e); 28995 (93); 29130 (93); 30374 (93); 30375 (93);
 31692 (96); 31944 (96); 32326 (96); 32380 (93); 32437 (80); 32449 (96);
 32707 (96); 32989 (96); 35055 (80); 40575 (96); 40664 (96); 50874 (94e);
 50874a (93); 50875 (93).
 ELBERT, J. — 1094 (98); 1362 (98); 2241 (98); 3042 (125).
 ELMER, A. D. E. — 8500 (6); 11389 (93); 14142 (11).
 FORBES, H. O. — 3818 (105).
 FOR. OFFICER KOEPANG — 8 (93).
 FOR. SERV., NETH. IND. — 188 (98), Ja. 2997 (98); s. n. 27.9.1933 (93); s. n. 10.5.1936
 (110).
 GIBBS, L. S. — 4126 (94e); 4305 (94e).
 GJELLERUP, K. — 1184 (94e).
 GRESSITT, LINSLEY — 441 (111); 488 (111).
 HALLER, H. — 575 (96).
 KJELLBERG, G. K. — 1168 (109); 1443 (43); 3925 (98).
 KOCK, DE — 83 (94d).
 LAM, H. J. — 1750 (17); 2150 (36).
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 STEENIS, C. G. G. J. VAN — 4597 (98).
 VERSTEEG, G. M. — 2413 (93); 2529 (93); 2544 (94b).
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obovata (Fawc.) J. J. S. (93)
obtusifolia J. J. S. (93)
papuana (C. H. Wright) J. J. S. (93)
philippinensis Merr. (93)
pungens (Jungh.) Koord. (93)
spicata J. J. S. (93)
trilocularis J. J. S. (93)
- (Styphelia)
Vannouhuysii J. J. S. (94b)
wetarensis J. J. S. (93)
Thyrsostachys (36)
siamensis Gamble (36)
Trachymene (143)
Trichoglottis (73)
Trochocarpa (94, 94a-f)
Urtica squamigera Wall. (144)
Utricularia (112)
Vaginularia (26)
Vandopsis (74)
Viola (146-148)
inconspicua Bl. (147)
Vittaria (27, 28)
Wahlenbergia (82)
marginata (Thunb.) A. DC. (82)
Weinmannia (92)

NOTES ON THE HISTORICAL PHYTOGEOGRAPHY OF CELEBES

by

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1. INTRODUCTORY REMARKS.

In one of his papers on Malaysian Orchids R. Schlechter (1911) expresses his surprise that the flora of Celebes, though promising so much from a phytogeographical point of view, is very little known in comparison with that of the Philippines and Java and even with that of Borneo. In 1926 E. D. Merrill repeated this assumption with little less emphasis, and it is, indeed, still holding good even nowadays. I am not able to tell the reason why Celebes has been so much neglected in this respect, though it has been given ample attention by zoogeographers.

Yet, botanical exploration has been carried out ever since the French scientific world cruises of the "Astrolabe" (1828) and the "Astrolabe" and the "Zélée" (1839). The more important collections have been enumerated in the "Appendix" to the present paper and among these the most outstanding ones are those made by the Neth.-Indian Forestry Service and by such individual collectors as Forsten (1840, N), Zollinger (1847, SW and Salajar), Teysmann and De Vriese (1860, N), Teysmann (1877, SW and Salajar), Warburg (1888, SW), Koorders (1894—'95, N), P. and F. Sarasin (1893—'96 and 1902—'03, all parts), Elbert (1909, SE), Schlechter (1910, N), Van Vuuren (1912—'14, SW, C, SE), Docters van Leeuwen (1913, Salajar, etc.), Kaudern (1917—'20, SE, C, E, N), Bünne-meijer (1921, SW), Lam (1926, Talaud), Kjellberg (1929—'30, SW, SE), Eyma (1938, C, E) and Monod de Froideville (1937—'39, SW, C, SE).

Of these collections only two or three were actually intended to contribute materials towards our phytogeographical knowledge of the island. Two of the explorations, viz. those made by Elbert and Van Vuuren were carried out in order to check parts of Wallace's Line; a third (Lam) intended to check the Philippines-Moluccas-New Guinea migration track.

How important an island Celebes is to the phytogeography of Malaysia is, for one thing, shown by the instructive map of the three main migration

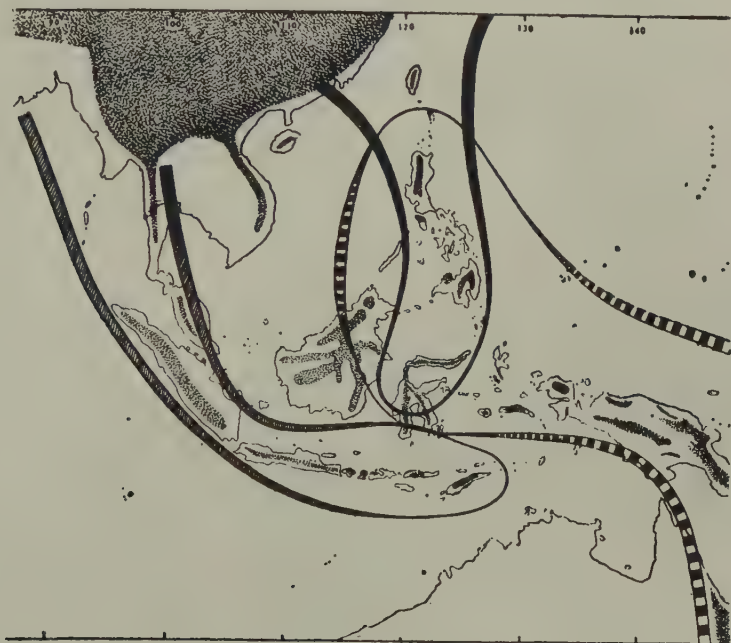


Fig. 1 — Three main migration tracks for mountain plants as conceived by Van Steenis (1934), the western part of the New Guinea track modified according to the paper of 1935. In 1938 another correction was added, by which the Philippine track was extended southward so as to include the whole of S.W. Celebes.

tracks for mountain plants (*Fig. 1*), published by Van Steenis (1934¹). It is also evidenced by the situation of the island relative to Wallace's Line. In fact, the most trustworthy, or should we rather say, the least dubious part of that historically famous line of demarcation is the Straits of Macassar between Celebes and Borneo, and until recently most biogeographers — and geologists — considered it an almost absolute or at least

¹) Cf. also Van Steenis 1938 (p. 732) where a correction is given to the New Guinea track so as to include N. Sumatra. This is, however, irrelevant to our present problem; neither is this likely to be the ultimate correction. The Philippine track has been extended southward so as to include the whole of the SW. Peninsula. This agrees, as will be shown underneath, with our results.

a most paramount barrier to migrations of plants and animals between the West and the East since early Tertiary times. However, it has been shown by the Sarasin's, Merrill, Hallier, Rensch, Lam and others that this barrier must have been outflanked both in the North (Borneo-Philippines-N. Celebes connection) and in the South (Java- and Flores-bridges).

In fact, one of the primary results of the extensive explorations of the Sarasin's was the assumption of four land-connections. The materials collected by them of Molluscs, Amphibians, Reptilians and Birds could be arranged into five area-categories, one containing the large or concentric areas as well as the doubtful cases, and four which were also checked geologically, suggesting migration tracks to Celebes each from a different direction. Their procentual proportions were:

| | |
|--|-------------|
| a. large areas and doubtful cases | 25.6 % |
| b. Java-bridge (Madoera-Kangean-SW. Celebes) | 28.3 % |
| c. Philippine-bridge (Mindanao-Sangihe-N. Celebes) | 21.9 % |
| d. Flores-bridge (Kalao-Djampea-Salajar-SW. Celebes) | 15.3 % |
| e. Moluccan bridge (Boeroe-Soela-E. Celebes) | 8.9 % |
| | <hr/> 100 % |

The proportion West ($b + c + > \frac{1}{2} a$) : East ($d + e + < \frac{1}{2} a$) is therefore at least 50.2 : 24.2 or 67.5 % : 32.5 %.

The conclusion was that Celebes possesses an old and more or less impoverished fauna (a statement already made in 1894 by Max Weber on account of his study on Fishes), subsequently enriched by younger infiltrations from different sources and directions. According to the Sarasin's Borneo and Celebes should never have been connected directly: no single species was known from Borneo and Celebes only.

These views were, in general, supported by the subsequent geological investigations by Abendanon who, however, accepts a direct Borneo-Celebes connection in the Oligocene period. According to him Celebes consisted during most of the Tertiary of a large northern island and a small southern one (SW. Celebes). Sarasin's Java-, Flores- and Philippine-bridges are, geologically speaking, not impossible but the latter is decidedly younger than the Sarasin's conceived, viz. of Plio-Plistocene age. The connection of SW. and C. Celebes is extremely recent (youngest Plistocene) and was only established after the Java- and Flores-bridges had been cut. As to the Moluccan bridge, this is considered doubtful since the connection E. Celebes-Banggai was already interrupted in the Miocene period. However, it must be added here, that the bathymetrical chart (cf. *Fig. 2*) made by the "Snellius Expedition" of 1929—'30 (Vol. II, Part. 2, Chapter II, P. M. van Riel, The bottom configuration, etc., 1934) shows a continuous submarine ridge connecting E. Celebes with New Guinea, which, except in one place (between Mangoli and Obimajor, less than 2000 m) is less than 1000 m below sea level. This suggests a possible former connection and, as will be shown underneath, this is also more in accordance with our present phytogeographical views.

In his book on the (zoogeographical) history of the Sunda Arch, Rensch (l. c., p. 252) calculated that the Celebes fauna as far as con-

sidered by him consists of 75 % western genera, 25 non-western (viz. 13 % "Wallacean¹⁾" and 12 % eastern). The same author (p. 268) accepts a SW. Celebes-E. Java connection and, after this had been severed, a SW. Celebes-Lombok connection. The first-named connection should also geologically be justified (Van Es and Umbgrove in Rensch, l. c., p. 278).

Phytogeographical studies generally supported the results obtained by the Sarasin's and Rensch for the fauna, though the state of our knowledge of the flora as well as the different nature of the material does not allow so far-reaching and detailed conclusions as the fauna was able to procure.

While Hallier and Warburg stipulated the SW. Celebes connections on account of plant areas (SE. Celebes is a "cul de sac"), Merrill did the same concerning the northern part. In his important study of 1923 he calculated that the Philippines harbour more eastern species than Borneo and more western ones than Celebes, further that of 365 Sundaland genera which are not known east of Wallace's Line, 218 or 61 % are found in the Philippines and that the reciprocal figures for eastern genera are 225, 56 and 25 %. These are the principal reasons why Lam (1938) suggested that the migration track between the Sundaland and the East runs through N. Borneo, Mindanao and N. Celebes to E. Celebes and the Moluccas. In addition, Holthuis and Lam showed in 1942 the importance of the Philippine-Talaud-Moluccas-New Guinea track (following the so-called "Snellius ridge", discovered by the Snellius Expedition) in which N. Celebes in many instances seems to have participated. They stated that of 160 Talaud species which are of some value in this respect, 110 or almost 69 % possess an area along this track.



Fig. 2 — Bottom configuration at a depth of 2000 m (according to Van Riel, Snellius Expedition).

¹⁾ "Wallacea" is the name of the unstable part of Malaysia between the Sunda- and the Sahul-shelves (cf. Merrill, 1923).

Several authors, e.g. the Sarasin's, have alluded to the fact that certain parts of the island show a fauna and flora different from those of others. More particularly a difference was stated between N. and SW. Celebes. It is true that separate families may lead to quite different results — the Orchids, for instance, show little regional differentiation — but we can avoid an undesirable one-sidedness by basing our conclusions upon an impartial selection from the flora, collecting our data from as many natural orders as possible. If this is done, there is undoubtedly a marked floristic difference, notably between N and SW. This may be partly due to a former disconnection between SW. Celebes and the rest of the island, partly to former infiltrations along the various bridges mentioned.

In how far these relations may be interpreted statistically will be discussed underneath, together with some other current problems, such as a possible direct connection between Borneo and Celebes and another between the Moluccas and Talaud, and Celebes.

2. OWN INVESTIGATIONS.

A. THE MATERIAL.

The immediate inducement to the following considerations was twofold: firstly the elaboration of the collection made by Mr. Monod de Froideville and presented to the "Rijksherbarium" in 1943 (v. *Blumea* V, n. 3, 1945, p. 554—599) and secondly the preparation of a paper on the vegetation and the flora of Celebes on behalf of a monograph of the island to be edited by the "Indisch Instituut" at Amsterdam.

On behalf of this work I prepared lists of carefully checked species and other groups with their distribution. These were borrowed from various sources. As far as the Orchids were concerned, I had the great privilege to obtain the collaboration of Dr J. J. Smith, who checked the areas of all Celebes species known at present (401 in all) and kindly put the results at my disposal. Pteridophytes were partly taken from Posthumus's paper on the Pteridophyta of the Elbert expedition (cf. Literature). The other plants were mostly borrowed from the numerous local monographs, published in the last twenty or twenty-five years in the "Bulletin du Jardin botanique de Buitenzorg" and in "*Blumea*". Others were taken from other sources but the utmost care was given to secure trustworthy data both systematically and geographically.

Only adequate areas were selected, in this sense that areas which, relative to Celebes, are either wide or concentric or endemic with unknown or concentric relationship, were ignored, with the result that of an original number of more than 1000 only 734, perhaps about one tenth of the actual number of higher plants, were left. Of these 31 were Pteridophytes and 263 Orchids, the other 440 are miscellaneous Phanerogams. The reason why Pteridophytes and Orchids were kept apart from other Phanerogams was that both of the two first-named groups are dispersed by wind; moreover, the Orchids possess the peculiar root fungus symbiosis which can hardly fail to have some bearing upon the dispersal of the species.

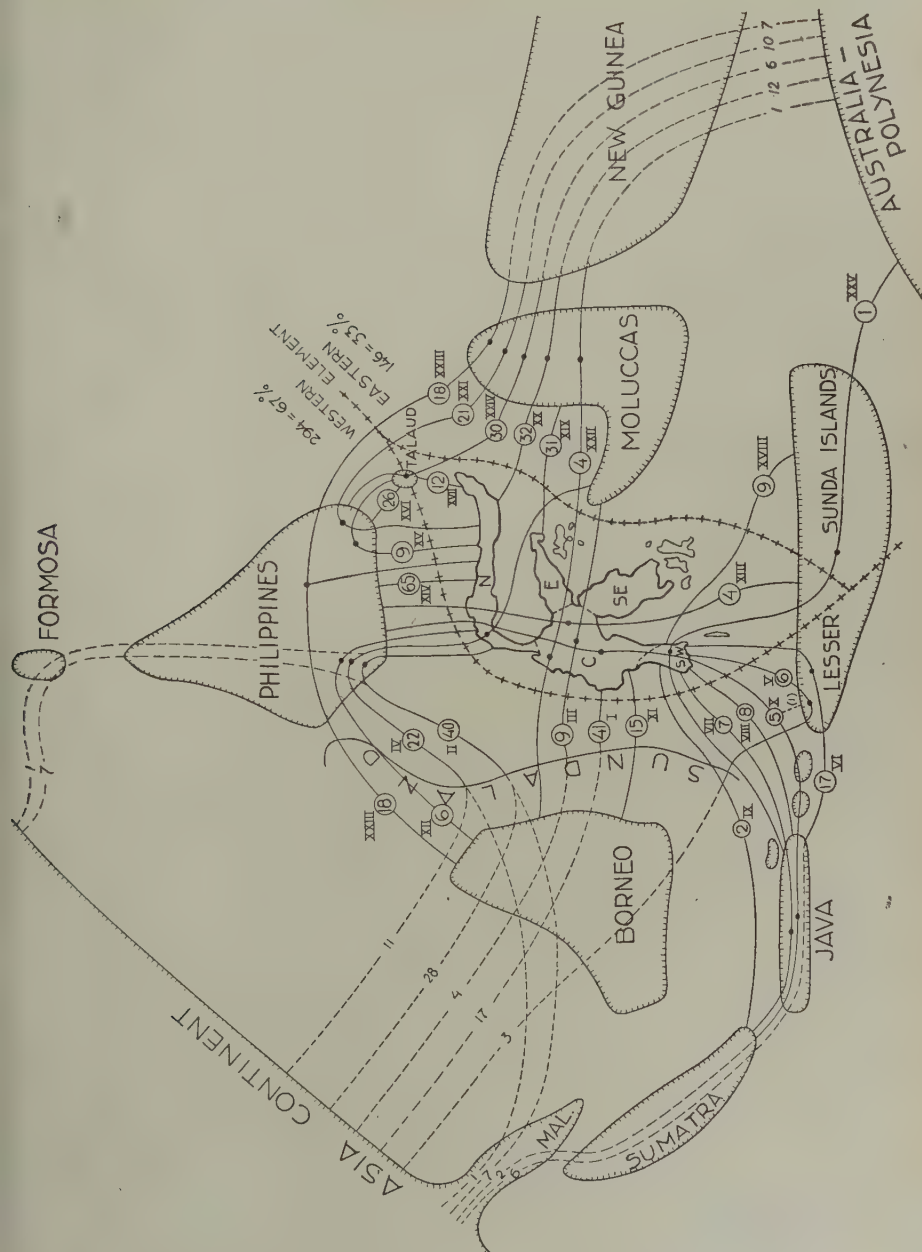


Fig. 3 — Phytogeographical map of Celebes and surrounding islands, based on the areas of 440 Phanerogams. I-XXV, Area categories of Table I (see there). Numbers in circles: numbers of species belonging to the area category, indicated by a continuous line. Connections and black dots always represent the whole island or region, not the part only in which they happen to be placed on the map.

B. AREA CATEGORIES.

On behalf of a phytogeographical subdivision of this material, 25 area categories were accepted, in which the species of the three groups participate as is shown in *Table I*. These categories, which are further illustrated by *Fig. 3*, are based upon actual areas or, in the case of endemics, on relationships.

TABLE I (cf. *Fig. 3*)

A. Western centre (\rightarrow also occurring in continental Asia; \Rightarrow one connection Philippines–N. Celebes, another E. Java–S.W. Celebes; Sundaland = Brit. Malaya + Sumatra + Java + Borneo + Palawan, or the greater part of it).

| | Pteridoph. | Orchids | Other Phanerog | Total |
|--|-----------------|---------------------------|--|--|
| I (\rightarrow) Sundaland–Celebes | 4 | 43 (4 \rightarrow) | 41 (17 \rightarrow) | 88 (21 \rightarrow) |
| II (\rightarrow) Sundaland–Philippines–Celebes | 6 | 10 (6 \rightarrow) | 40 (21 \rightarrow) 7 \Rightarrow | 56 (27 \rightarrow) 7 \Rightarrow |
| III (\rightarrow) Sundaland–Celebes–Moluccas | — | 4 (1 \rightarrow) | 9 (4 \rightarrow) | 13 (5 \rightarrow) |
| IV (\rightarrow) Sundaland–Philippines–Celebes–Moluccas | 4 | 2 | 22 (11 \rightarrow) 1 \Rightarrow | 28 (11 \rightarrow) 1 \Rightarrow |
| V (\rightarrow) Sundaland–Lesser Sunda Islands–Celebes ¹⁾ 1 also in Moluccas | 2 ¹⁾ | 3 | 6 (3 \rightarrow) | 10 (3 \rightarrow) |
| VI (\rightarrow) Java–Lesser Sunda Islands–Celebes | — | 2 | 17 (6 \rightarrow) | 19 (6 \rightarrow) |
| VII (\rightarrow) Sumatra–Java–Celebes | 2 | 32 (16 \rightarrow) | 7 | 41 (16 \rightarrow) |
| VIII Java–Celebes | 2 | 27 | 8 | 37 |
| IX (\rightarrow) Sumatra–Celebes | — | 7 (1 \rightarrow) | 2 | 9 (1 \rightarrow) |
| X (\rightarrow) Sumatra–Java–Celebes–Philippines * — Lesser Sunda Islands) | 1 (1*) | 2 (1*) | 5 (2 \rightarrow) (1*) | 8 (2 \rightarrow) (3*) |
| XI Borneo–Celebes | — | 8 | 15 | 23 |

| | Pteridoph. | Orchids | Other Phanerog. | Total |
|--------------------------------|------------|---------------|----------------------|----------------------|
| XII Borneo-Philippines-Celebes | 1 | — | 6 | 8 |
| Totals A | 22 | 140 (28 →) | 178 (64 → 8 →) | 340 (92 → 8 →) |

B. Northern Centre.

| | | | | |
|--|---|----|-----|-----|
| XIII Philippines-Celebes-Lesser Sunda Islands | — | — | 4 | 4 |
| XIV Philippines-Celebes | 1 | 21 | 65 | 87 |
| XV Philippines-Talaud and Celebes | — | — | 9 | 9 |
| XVI Philippines-Talaud | 1 | — | 26 | 27 |
| XVII Talaud-Celebes | — | 1 | 12 | 13 |
| Totals B | 2 | 22 | 116 | 140 |

C. Eastern Centre (← also in Australia and/or Polynesia).

| | | | | |
|--|-----------------|------------------|--------------------------|--------------|
| XVIII Lesser Sunda Islands-Celebes ¹⁾ also in Polynesia | 1 ¹⁾ | 4 | 9 | 14 |
| XIX Moluccas-Celebes ¹⁾ 1 also in Borneo | — | 28 ¹⁾ | 31 | 59 |
| XX New Guinea-(Moluccas-)Celebes (←) | 1 | 58 (1 ←) | 32 (12 ←) | 91 (13 ←) |
| XXI New Guinea-Moluccas-Philippines-Celebes (←) | — | 2 | 21 (10 ←) | 23 (10 ←) |
| XXII New Guinea-Moluccas-Celebes-Borneo (←) ¹⁾ 1 in Java instead of Borneo | 1 | — | 4 ¹⁾ (1 ←) | 5 (1 ←) |
| XXIII New Guinea-Moluccas-Philippines-Celebes and Borneo) (←) | — | 1 (1 ←) | 18 (7 ←) | 19 (8 ←) |
| XXIV New Guinea-Moluccas-Talaud (Philippines) (←) | 4 (1 ←) | 8 (1 ←) | 30 (6 ←) | 42 (8 ←) |

| | Pteridoph. | Orchids | Other Phanerog. | Total |
|---|-------------|----------------------|------------------------------|------------------------------|
| XXV Lesser Sunda Islands-Celebes- Java (←) | — | — | 1 (1 ←) | 1 (1 ←) |
| Totals C | 7 (1 ←) | 101 (3 ←) | 146 (37 ←) | 254 (41 ←) |
| Grand-Totals | 31 (1 ←) | 263 (28 → 3 ←) | 440 (64 → 8 → 37 ←) | 734 (92 → 8 → 41 ←) |

C. THE WEST-EAST PROPORTION.

If group B may be considered to represent the western element (cf. Lam in Blumea III¹, 1938, 142—147), an assumption which is, by the way, only partly justified regarding the categories XIII and XVI (31 species in all), the proportion of the western (A + B) and the eastern (C) element is the following, in which because of the said categories XIII and XVI the figures for West are maxima, those for East minima:

| | | | | |
|----------------------------|-------|-------------|------------|------|
| for the Pteridophytes only | 24 : | 7 or 77 % | West, 23 % | East |
| „ „ Orchids only | 162 : | 101 or 62 % | „ , 38 % | „ |
| „ „ other Phanerogams | 294 : | 146 or 67 % | „ , 33 % | „ |
| „ all plants considered | 480 : | 254 or 65 % | „ , 35 % | „ |

It may be stated here that the proportion West/East, as calculated by the Sarasin's for the fauna, is almost exactly the same as that obtained by us for the Phanerogams except the Orchids, viz. 67 % : 33 %. Again exactly the same proportion was found by Holthuis and Lam for Talaud (1942). This confirms the opinion that the Celebes flora is preponderantly Asiatic. We deem it unlikely that statistics based upon larger numbers of species will fundamentally alter the proportion W : E = 2 : 1. The number of Pteridophytes is, of course, too low to guarantee for them alone any trustworthy results in this matter.

D. ENUMERATION OF THE SPECIES ("OTHER PHANEROGAMS" ONLY).

In order to give an idea of the species concerned, it seems worth while to enumerate those of the general group. In the following list an asterisk (*) denotes endemic species. Behind each name the regions are indicated — as far as they could be traced — in which the species has been collected: SW, SE, C, E and N; "all" means that the species in question actually is known or readily may be expected to occur in all of the five parts; it is accepted that this condition is extant as soon

as a species occurs both in SW and in N. The boundaries between the central part and the N, E and SE peninsulae have been drawn at the spot where these arms are connected with the "main body" of the island, viz. between C and N along the line Paloe—south of Parigi, between C and E along the line Oeë Koeli—Tambajoli Bay, and between C and SE along the line Kolonodale—Malili. Regarding the SW arm, however, this procedure could not be followed, since the "Tempe depression" (along the line Pinrang—Pampanoea), which is only 12 m above sea-level, affords a much more natural boundary between C and SW than the line Boengin—Palopo, which has been adopted as a boundary by the Sarasin's. Furthermore, the following abbreviations have been used in the list: r = connection on account of relation; Amb. = Amboina; And. = Andamans; Austr. = Australia; Boet. = Boeton; BNB = Brit. North Borneo; Flor. = Flores; Form. = Formosa; Kab. = Kabaena; Kngn. = Kangean; LSI = Lesser Sunda Islands; Lomb. = Lombok; Luz. = Luzon; Mar. = Marianas; Mind. = Mindanao; Mol. = Moluccas; Mor. = Morotai; NG = New Guinea; Pal. = Palawan; Sal. = Salajar; SEB = S.E. Borneo; Sum. = Sumatra; Tan. = Tanimbar; T.B. = Toekang Besi; Tim. = Timor; Tl. = Talaud.

Area Categories of 440 Celebes Phanerogams.

I. (→) *Sundaland-Celebes*.

- 1.* → *Aeginetia selebica* Bakh. (r, SW, C)
- 2.* *Alangium maliliense* Bloemb. (r, C)
3. *Baccaurea javanica* (Bl.) M.A. (N, Tl)
4. → *Blastus Cogniauxii* Stapf (SE)
5. *Canarium littorale* Bl. (C)
6. → *Cerastium indicum* Wall. (SW)
- 7.* *Cinnamomum Koordersi* Cammerl. (r, N)
- 8.* " *pilosum* Cammerl. (r, SW)
9. *Cissus nodosa* Bl. (N, Tl)
10. *Conocephalus suaveolens* Bl. (N)
11. → *Cynoglossum javanicum* (Thunb.) DC. (SW)
12. " *micanthum* Desf. (C)
- 13.* *Dendrophthoe locellata* Dans. (r, SW)
- 14.* " *pauciflora* Dans. (r, E, N)
15. → *Diospyros frutescens* Bl. (N)
16. *Dysoxylum acutangulum* Miq. (N)
17. " *densiflorum* Miq. (N)
18. *Fagraea fragrans* Roxb. (SW, SE, C)
- 19.* → *Gentiana lateriflora* Hemsl. (r, SW)
20. → *Helixanthera cylindrica* (Jack) Dans. (SW, C)
21. → *Lysimachia japonica* Thunb. (SW)
- 22.* *Medinilla celebica* Bakh.f. (r, N)
23. *Nepenthes gracilis* Korth. (C)
24. *Oldenlandia subulata* Korth. (SW)
25. → *Otanthra celebica* Bl. (N, And.)
26. → *Pachycentria constricta* (Bl.) Bl. (C?, N)

- 27.* *Palaquium multiflorum* Pierre (r, C)
28. ,, *obovatum* (Griff.) Engl., var. α *occidentale*
 H. J. Lam (C)
29. → *Pericopsis* (genus) (?)
- 30.* → *Poliothyrsis* Stapfii Koord. (r, N)
31. *Pouteria malaccensis* (Clarke) Baehni (C)
32. → *Ranunculus diffusus* DC. (SW)
- 33.* → ,, *Frigidurbis* H. J. Lam (r, SW)
- 34.* *Rhododendron celebicum* DC. (r, SW, N)
35. *Santiria laevigata* Bl. (C)
36. → *Sloetia* (genus) (C, N)
- 37.* *Sonerila celebica* Bakh.f. (r, C)
38. *Sterculia macrophylla* Vent. (Boet., C)
39. → *Themeda villosa* (Poir.) Hack. (SW)
40. *Trichosporum radicans* (Jack) Nees (N, TI)
- 41.* *Vaccinium dubiosum* J. J. S. (r, C)

II. (→) *Sundaland-Philippines-Celebes* (eventually also in *Lesser Sunda Islands*)

1. → *Alangium salvifolium* (L.f.) Wang. (SW, C; Balabac, LSI)
- 2.* *Amorphophallus plicatus* M. B. Bok & H. J. Lam (r, N; Coch. Ch.)
3. → *Buchanania arborescens* Bl. (N, TI; Soemba)
4. → *Chamabainia cuspidata* Wight (SW)
5. → *Cinnamomum iners* Reinw. (SW)
6. → *Cissus hastata* (Miq.) Planch. (N, TI)
7. *Cyclostemon Minahassae* Boerl. & Koord. (N, TI)
8. → *Dacryodes rostrata* (Bl.) H. J. Lam (N)
9. *Diospyros Korthalsiana* Hiern (SE)
10. ,, *macrophylla* Bl. (C; S. Phil.)
11. ⇒ ,, *montana* Roxb. (SW, SE, C; LSI, Luz.)
12. ⇒ *Flacourtia indica* (Burm.f.) Merr. (SW; Leti)
13. → *Garuga* (genus) (all)
14. → *Gleditschia* (genus) (N)
15. *Glochidion rubrum* Bl. (TI)
- 16.* *Homalium celebicum* Koord. (r, all)
- 17.* *Lepeostegeres alveolatus* (v. Tiegh.) Dans. (r, SE, C)
18. → *Limnophila chinensis* (Osbeck.) Merr. (C)
19. → *Lindernia cordifolia* (Colson.) Merr. (C)
20. *Macaranga triloba* (Bl.) M. A. (TI, Pal.)
21. → *Macrosolen cochinchinensis* (Lour.) v. Tiegh. (N)
22. *Medinilla crassifolia* (Reinw.) Bl. (C, N)
23. → *Memeylon laevigatum* Bl. (SW)
24. → *Merremia vitifolia* (Burm.f.) Hall.f. (all; LSI)
25. → *Morinda celebica* Miq. (SW)
26. *Neodissochaeta celebica* (Bl.) Bakh.f. (C?, N)
27. → *Oroxylum indicum* (S.) Vent. (all; Tim.)
28. → *Parkia javanica* (Lamk.) Merr. (N; Tim.)

29. *Piper abbreviatum* Opiz (all; Bali, Lomb.)
30. ➡ *Polygonum caespitosum* Bl. (SW)
31. ➡ „ *perfoliatum* L. (C; NG)
32. ➡ „ *pulchrum* Bl. (SW; N. Phil.)
33. → *Pratia nummularia* (Lamk.) Kurz (C)
- 34.* *Rhododendron Vanvuurenii* J. J. S. (C)
35. → *Schima* (genus) (?; Pal.)
36. ➡ *Sceloporia crenata* Clos (SW, SE)
37. → *Scurrula ferruginea* (Jack) Dans. (E; Tl)
38. → *Strophoblachia fimbriicalyx* Boerl. (Sal.; Coch.Ch.)
39. ➡ *Taxus baccata* L. var. *Wallichiana* Pilg. (SW, C; N. Phil.)
40. → *Viola arcuata* Bl. (C)

III. (→) *Sundaland-Celebes-Moluccas*

1. → *Alangium Griffithii* (Clarke) Harms (C)
2. „ *javanicum* (Bl.) Wang. (C, N)
3. *Astronia macrophylla* Bl. (N, Tl)
4. → *Balanostreblus ilicifolia* Kurz (N)
5. → *Dendrophthoe falcata* (L.f.) Ettingsh. (SW)
6. *Gnetum cuspidatum* Bl. (Tl)
7. → *Intsia retusa* (Kurz) O. Ktze (SE, C)
8. *Polyalthia lateriflora* (Bl.) Kurz (N)
9. *Terminalia hederica* Roxb. (N)

IV. (→) *Sundaland-Philippines-Celebes-Moluccas*

1. → *Adenosma bilabiatum* (Roxb.) Merr. (SW)
2. → *Ajuga bracteosa* Benth. (E, Tl)
3. → *Bonamia semidigyna* (Roxb.) Hall.f. (SW)
4. → *Combretum acuminatum* Roxb. (SW; Soela)
5. → *Diospyros cauliflora* Bl. (C, N)
6. „ *pilosanthera* Blanco (SE, N)
7. → *Eragrostis unioides* Nees (all)
8. → *Garcinia cornea* L. (all)
9. *Ginalloa Arnottiana* Korth. (all)
10. → *Lepistemon binectariferum* (Wall.) O. K. (C?, N)
11. *Memecylon costatum* Miq. (N, Tl)
12. *Microstegium fasciculatum* (L.) Henr. (N)
13. *Nothaphoebe umbelliflora* Bl. (C, N, Tl)
14. *Pangium edule* Reinw. (SE, N)
15. → *Porana volubilis* Burm.f. (SW)
16. *Rhododendron malayanum* Jack (C; to Mind.; + Flor.)
17. → *Rhynchoglossum obliquum* Bl. (SW)
18. *Santiria apiculata* Benn. (SW, C)
19. *Scurrula fusca* (Bl.) G. Don (all)
20. ➡ *Shorea* (genus) (SE, N; not in Java)
21. *Terminalia edulis* Blanco (all)
22. → *Turpinia pomifera* (Roxb.) DC. (C, N, Tl; Form.)

V. (→) *Sundaland-(SW)Celebes-Lesser Sunda Islands (ev. Moluccas)*

1. → *Adenostemma macrophyllum* (Bl.) DC. (SW; Ceram)
2. *Cinnamomum Burmanni* Bl. (SW; Soemba)
3. → *Combretum latifolium* Bl. (SW, SE; Flor.)
4. → *Intsia palembanica* Miq. (SW, C)
5. *Planchonia valida* Bl. (all; Aroe)
6. *Randia oppositifolia* Koord. (all)

VI. (→) *Java-Celebes-Lesser Sunda Islands*

1. *Astronia spectabilis* Bl. (SW)
- 2.* *Diospyros eburnea* Bakh. (r, all)
- 3.* „ *Greshoffiana* Koord. (r, N)
4. → „ *malabarica* (Desr.) Kostel. (all)
- 5.* „ *venenosa* Bakh. (r, SW, SE, C)
6. *Hypericum Hookerianum* W. et A. (SW; Lomb.)
7. *Ipomoea Decaisnei* v. Ooststr. (SW, Boet.)
8. → „ *maxima* (L.f.) Don (SW)
9. „ *trichosperma* Bl. (Sal., Boet.)
10. *Ixora timorensis* Deene. (SW, SE; + Kai)
11. → *Osbeckia dolichophylla* Naud. (SW)
12. → *Porana racemosa* Roxb. (SW)
13. *Rhododendron Zollingeri* J. J. S. (C; Bali, Lomb.)
14. → *Schleichera trijuga* Willd. (= *oleosa* Merr.) (Kab., Moena, Boet.; Banda, Amb.)
15. *Tabernaemontana sphaerocarpa* Bl. (Moena, N)
16. *Vernonia erigeroides* DC. (Sal.)
17. → *Viola serpens* Wall. (SW)

VII. (→) *Sumatra-Java-Celebes*

1. *Calamagrostis australis* Buse (SW; Bali)
2. *Carex longibracteata* Steud. (SW; Bali)
3. *Geranium ardjunense* Z. et M. (SW)
4. *Medinilla laurifolia* (Bl.) Bl. (all)
- 5.* *Radermachera elegans* v. Steen. (r, N)
6. *Tetrameles nudiflora* R. Br. (all; Kngn, Lomb.)
- 7.* *Vernonia Reinwardtiana* De Vriese (r, N)

VIII. *Java-Celebes.*

1. *Cladopus Nymani* H. Möll. (SW)
2. *Dicymanthes breviflora* Dans. (N)
- 3.* *Difflugossa Everettii* (Rolfe) Brem. (r, SW)
- 4.* *Diplycosia hirsuta* Sleum. (r, C)
5. *Phaleria urens* (Reinw.) Koord. (N, Tl)
6. *Plectranthus Teysmanni* Miq. (SW)
- 7.* *Rhaphidospora celebica* Brem. (r, C)
- 8.* *Vernonia subtilis* Kost. (r, SW)

IX. *Sumatra-Celebes*

- 1.* *Diplycosia aperta* J. J. S. (r, C)
- 2.* ,, *retusa* Sleum. (r, C)

X. (→) *Sumatra-Java-Celebes-Philippines* (ev. *Lesser Sunda Islands*)

1. → *Acer niveum* Hassk. (N)
2. → *Festuca leptopogon* Stapf (SW)
3. *Podocarpus amara* Bl. (SW, C; LSI)
4. *Taraktogenos heterophylla* (Bl.) v. Sl. (N)
- 5.* *Vaccinium lucidum* Miq. (r, SW, C)

XI. *Borneo (Palawan)-Celebes*

- 1.* *Argyreia cinerea* v. Ooststr. (r, N)
- 2.* *Boea leporina* H. J. Lam (r, C)
3. *Brownlowia Beccarii* (Mast.) Pierre (? , Tl)
4. *Dendrophthoe constricta* (Korth.) Dans. (C, N)
5. *Diospyros Beccarii* Hiern (N)
- 6.* *Driessenia ferox* Bakh.f. (r, BNB) (C)
7. *Fagraea bracteosa* Camm. (C?, Pal.)
- 8.* *Gentiana uncifolia* H. J. Lam (r, BNB) (C)
9. *Helixanthera xestophylla* (Miq.) Dans. (C)
10. *Litsea accedens* (Meissn.) Boerl. (N, Tl)
11. *Mastixia parvifolia* Hall. (SE)
12. *Melastoma nitidum* Korth. (SE [Kab.])
13. *Nepenthes tentaculata* Hook.f. (C)
14. *Pratia borneensis* Hemsl. (BNB) (C)
- 15.* *Vaccinium Henrii* Sleum. (r, BNB) (SW)

XII. *Borneo-Philippines-Celebes*

1. *Camptostemon philippense* (Vid.) Becc. (mangrove) (SEB; all)
2. *Hydnocarpus Hutchinsonii* Merr. (BNB, N)
3. *Ixora philippensis* Merr. (BNB; N; Soela)
4. *Madhuca betis* (Merr.) Macbr. (N)
5. *Phyllocladus hypophyllus* Hook.f. (BNB; C)
6. *Styphelia suaveolens* (Hook.f.) Koord. (SW)

XIII. *Philippines-Celebes-Lesser Sunda Islands* (ev. *Moluccas*)

1. *Astenochloa tenera* Buse (Sal.; E. Java)
2. *Buchnera urticifolia* R. Br., var. *glaberrima* H. J. Lam (SW, C)
3. *Pycnarrhena celebica* (Boerl.) Diels (all; Kngn, Soemba)
4. *Rubus fraxinifolius* Poir. ssp. *celebicus* Bl. (all; Mol.)

XIV. *Philippines (M = Mindanao only)-Celebes*

1. *Acanthophora scandens* Merr. (N)
2. *Agathis philippinensis* Warb. (C, N)

3. *Aglaonema Haenkei* (Presl) Schott (N)
4. *Alocasia heterophylla* (Presl) Merr. (N)
5. *Argostemma solaniflorum* Elm. (C)
- 6.* *Argyreia celebica* v. Ooststr. (r, N)
7. *Begonia pseudolateralis* Warb. (N)
8. *Calamus symphisipus* Mart. (N)
9. *Canarium Vrieseanum* Engl. (C, N)
10. *Casearia densifolia* Elm. (SW)
11. *Casuarina Rumphiana* Miq. (SE, C, N)
12. *Cratoxylon celebicum* Bl. (C, N)
13. *Dalbergia mimosella* (Blanco) Prain (N)
14. *Dillenia ochreatea* T. & B. (N)
15. *Diospyros philippinensis* A. DC. (N; M)
- 16.* *Diplycosia caryophylloides* J. J. S. (r, SE)
- 17.* " *celebensis* J. J. S. (r, C)
- 18.* " *Kjellbergii* J. J. S. (r, SE)
- 19.* " *sagittanthera* J. J. S. (r, SE)
20. *Elaeocarpus Cumingii* Turcz. (N)
21. *Euphorianthus obtusatus* Radlk. (all)
22. *Elatostema delicatulum* Wedd. (SW)
23. *Fagraea plumeriifolia* A. DC. (N)
- 24.* *Gaultheria celebica* J. J. S. (r, C)
25. *Gleditschia Rolfei* Vid. (N)
26. *Glochidion album* (Blanco) Boerl. (N; to Form.)
27. *Hedyotis benguetensis* (Elm.) Elm. (SW)
- 28.* " *coryphocetes* Brem. (r, SW)
- 29.* *Hemigraphis celebica* Brem. ined. (r, C)
- 30.* " *mandarensis* Brem. ined. (r, C)
31. *Hoya* subg. (*H. gracilis* Schlecht. + *H. imbricata* Decne. +
 H. pseudomaxima Koord.) (N)
32. *Ixora Bartlingii* Elm. (N)
33. " *filipes* Val. (N)
34. *Kibara obtusa* Bl. (N)
35. *Lobelia philippinensis* Skottsb. (SW)
36. *Madhuca philippinensis* Merr. (SE)
- 37.* *Medinilla malaboensis* Bakh.f. (r, SW)
38. " *Cumingii* Naud. (N)
- 39.* *Myriactis spec.* (C)
40. *Neotrewia Cumingiana* (M. A.) Pax & Hoffm. (N)
41. *Nepenthes Merrilliana* Macf. (N; M)
42. *Osmelia celebica* Koord. (N)
43. *Pithecellobium subacutum* Benth. (N)
44. *Pleomele multiflora* (Warb.) Merr. (N)
45. *Pouteria fragrans* (Elm.) H. J. L. (SW)
46. *Premna Cumingiana* Schau. (N)
47. *Quercus Minahassae* Koord. (N; M)
48. *Radermachera Fenicis* Merr. (SW)
49. " *pinnata* (Blanco) Seem. (SW, SE)
50. *Reinwardtiodendron celebicum* Koord. (N)

51. *Scaevola Minahassae* Koord. (N; M)
52. *Scindapsus falcifolius* Engl. (N)
- 53.* *Shorea Koordersii* Brand. (r, N)
54. *Sonerila brachyandra* Naud. (SW)
55. *Spiraeopsis celebica* (Bl.) Miq. (C, N)
56. *Tabernaemontana mucronata* Merr. (N)
57. *Tarrietia sylvatica* (Vid.) Merr. (SW, N)
58. *Ternstroemia toquian* F.-Vill. (N)
59. *Tetraplasandra* (genus) (N, Tl; Pal.)
60. *Teysmanniodendron longifolium* (Merr.) H. J. Lam (Mind.) (SW)
- 61.* *Vaccinium Kjellbergii* J. J. S. (r, C)
62. *Vernonia Elmeri* Merr. (all)
63. *Wallaceodendron celebicum* Koord. (SE, N)
64. *Weinmannia urdanetensis* Elm. (C)
65. *Wendlandia luzoniensis* DC. (SW, C)

XV. *Talaut-Philippines-Celebes*

1. *Amyema celebica* (v. Tiegh.) Dans. (SE, N, Tl)
2. *Couthovia celebica* Koord. (N, Tl)
3. *Elaeocarpus multiflorus* (Turcz.) F.-Vill. (N, Tl)
4. *Elmerrillia ovalis* Dandy (C, N, Tl)
5. *Ficus Minahassae* (T. & De Vr.) Miq. (N, Tl)
6. *Garcinia tetrandra* Pierre (all)
7. *Hemigraphis lanceolata* Merr. (N, Tl)
8. *Palaquium bataanense* Merr. (C, N, Tl)
9. " *luzoniense* (F. Vill.) Vid. (C, N, Tl)

XVI. *Philippines-Talaut*

1. *Antidesma Cumingii* M.-A.
2. *Antirrhoea microphylla* (Bartl.) Merr.
3. *Blumeodendron paucinervium* (Elm.) Merr.
4. *Boerlageodendron serratifolium* Elm.
5. *Cladium philippinense* Merr.
6. *Cyathocalyx acuminatus* C. B. Rob.
7. *Cyclostemon littoralis* C. B. Rob.
8. *Decaspermum Blancoi* Vid.
9. *Dischidia Copelandii* Schlecht.
10. *Eugenia calubeob* C. B. Rob.
11. " *Everettii* C. B. Rob.
12. " *panduriformis* Elm.
13. *Garcinia rhizophoroides* Elm.
- 14.* *Gynochthodes* nov. spec. (r)
15. *Iaera lanaensis* (Merr.) Copel.
16. *Ilex paucinervia* Merr.
17. *Melicope triphylla* (Lamk.) Merr.
18. *Mussaenda philippica* A. Rich.
- 19.* *Psychotria* spec. n. (r)

20. *Scaevola micrantha* Presl.
21. *Schefflera ovoidea* Merr.
22. *Strombosia philippinensis* (Baill.) Rolfe
23. *Terminalia Copelandi* Elm.
24. *Trichospermum eriopodum* (Turcz.) Merr.
25. *Tylophora Perrottetiana* Decne.
26. *Vaccinium Vidalii* Merr. & Rolfe.

XVII. *Talaud-Celebes*

1. *Alpinia pectinata* "Ridl." (N?)
2. *Cinnamomum celebicum* Miq. (N)
3. *Evodia Minahassae* (Miq.) T. & B. (N)
4. *Ficus botryocarpa* Miq. (N)
5. *Geniostoma celebicum* Val. (all)
- 6.* *Jasminum suberosum* Holth. (r, N)
7. *Myristica celebica* Miq. (N)
8. *Ophiorrhiza parviflora* Reinw. (all)
9. *Polyalthia celebica* Miq. (N)
10. *Pterospermum celebica* Miq. (all)
11. *Stephania cauliflora* Becc. (SE, C)
12. *Timonius celebicus* Koord. (N)

XVIII. *Lesser Sunda Islands-Celebes* (ev. *Amboina*)

- 1.* *Amyema anisomeres* Dans. (r, C; Tim.)
2. *Amylothea stenopetala* (Oliv.) Dans. (all; Flor.)
- 3.* *Ipomoea stibaropoda* v. Ooststr. (r; Djampea, Tim.)
4. *Quisqualis sulcata* v. Sl. (Kal. Toea, Wetar)
5. *Stictocardia neglecta* v. Ooststr. (SW; Sal.)
6. *Trachymene acerifolia* Norm. (SE, C).
7. *Vernonia actaea* Kost. (Sal., Moena, T. B., Tan.)
8. " *moluccensis* (Bl.) Miq. (SW; Bali to Amb.)
9. *Xylosma amara* (Span.) Koord. (SE; Tim.)

XIX. *Moluccas-Celebes*

1. *Adina fagifolia* (T. & B.) Val. (C, N)
2. *Albizzia Minahassae* Koord. (N)
3. *Amomum roseum* (T. & B.) Benth. & Hook. (N, Tl)
4. *Amylothea Zollingeri* (Engl.) v. Tiegh. (SW; to Kngn)
5. *Artocarpus reticulata* Miq. (N, Tl, Boet.)
6. *Buchanania amboinensis* Miq. (N)
7. *Canarium balsamiferum* Willd. (all)
8. " *commune* L. (all; to Kngn)
9. " *multijugum* H. J. Lam (C)
10. *Colona scabra* (Sm.) Burret (SE, Tl)
11. *Diospyros Minahasae* Bakh. (C, N)
12. " *Rumphii* Bakh. (N, Tl)
13. *Elatostema polioneurum* Hall.f. (N, Tl)
14. *Ficus adenosperma* Miq. (N)

15. *Haplolobus celebicus* H. J. Lam (C, N?)
16. *Hemigraphis stenophylla* Hall.f. (N; Mor.)
17. *Homalium minahassae* Koord. (N)
18. *Itoa Stapfii* (Koord.) Sleum. (N)
19. *Ixora* subg. *Eu-Ixora* Brem., sect. *Ixorastrum* Brem., ser. *Macrothyrsae* + *I. inexpecta* Brem. (SE, C, N)
20. *Litsea Forstenii* (Bl.) Boerl. (all)
21. *Mastersia Bakeri* (Koord.) Back. (N; N. Mol.)
22. *Medinilla crispata* (L.) Bl. (N)
23. " *ternatensis* Miq. (N)
24. *Mischophloeus paniculatus* (Scheff.) Scheff. (N, TI)
25. *Polyscias Rumphiana* Harms (N, TI; Tim.)
- 26.* *Rhododendron impositum* J. J. S. (r, C)
- 27.* " *Kjellbergii* J. J. S. (r, C)
- 28.* " *lagunclicarpum* J. J. S. (r, C)
- 29.* " *poremense* J. J. S. (r, SE)
30. *Schuurmansia elegans* Bl. (N)
31. *Sterculia comosa* Wall. (TI)

XX. *New Guinea-(Moluccas-)Celebes* (ev. *Lesser Sunda Islands*) (←)

- 1.* *Amylotheca celebica* (Hemsl.) Dans. (r, SW)
2. *Canarium acutifolium* (DC.) Merr. (C)
3. " *maluense* Laut. (C; NG)
4. " *oleosum* Engl. (N; + Tim.)
5. *Clematis aristata* R. Br. (N, TI; LSI) ←
- 6.* *Diospyros celebica* Bakh. (r, C, N; NG)
7. " *ellipticifolia* (Stok.) Bakh. (SW, C) ←
8. *Gmelina palawensis* H. J. Lam (C; Palau) ←
9. *Gnetum gnemon* L., var. *silvestre* (Brongn.) Parl. (N, TI) ←
10. *Gomphandra australiana* F. Muell. (N, TI) ←
11. *Grevillea* (genus) (C; NG, Austr.) ←
12. *Ixora* subg. *Eu-Ixora* Brem., sect. *Otobactrum* Brem., ser. *Cauliflorae* (SE)
13. *Lepistemon urceolatum* (R. Br.) F. Muell. (all) ←
14. *Litsea* aff. *calophyllantha* K. Schum. (C; NG)
15. *Macadamia* (genus) (C; Austr.) ←
16. *Medinilla crassinervia* Bl. (N)
17. " *rosea* Gaud. (N; Mar.) ←
18. *Neuburgia tubiflora* Bl. (C)
19. *Palaquium amboinense* Burck (E)
- 20.* *Podocarpus daerydiifolia* Wassch. (r, C, NG)
21. *Potentilla papuana* Focke (SW)
22. *Pouteria moluccana* (Burck) Baehni (C; Flor.)
23. " *obovoidea* (H. J. L.) Baehni (SE; + Tim.)
24. *Premna sessilifolia* H. J. Lam (C; NG)
- 25.* *Trachymene acrotricha* Buw. (r, C; NG)
26. " *arfakensis* (Gibbs) Buw. (C?; NG)
- 27.* " *erodioides* Buw. (r, C; NG)
- 28.* *Trochocarpa celebica* (J. J. S.) H. J. Lam (C) ←

29. *Tylecarpus papuanus* (Becc.) Engl. (C)
- 30.* *Vaccinium pilosilobum* J. J. S. (r, C)
- 31.* " *tomicipes* J. J. S. (r, C)
32. *Vernonia lanceolata* (Warb.) Mattf. (N, Tl) ←

XXI. *New Guinea-Moluccas-Philippines-Celebes* (←)

1. *Aneilema vitiense* Seem. (N, Tl, Tim.) ←
2. *Anomopanax* (genus) (all)
3. *Couthovia* (genus) (N)
4. *Diospyros hebecarpa* Cunn. (all) ←
5. *Elmerrillia* (genus) (N)
6. *Eucalyptus* (genus) (all; Mind., Tim. c.a.) ←
7. *Euphorianthus* (genus) (all)
8. *Ixora* subg. *Pavettoides* Brem., sect. *Pavettopsis* Brem., ser. *Orientalis* (all) ←
9. *Macaranga hispida* (Bl.) M. A. (all)
10. " *Mappa* (L.) M. A. (N, Tl)
11. *Ormosia calavensis* Az. (N, Tl) ←
12. *Podocarpus Pilgeri* Foxw. (SW, C) ←
13. *Pothos Rumphii* Schott (N, Tl)
14. *Pueraria pulcherrima* (Koord.) Merr. (N, Tl)
15. *Scaevola*, Sect. *Enantiophyllum* (SW; Mol.) ←
16. *Schuurmansia* (genus) (N) ←
17. *Scutellaria luzonica* Rolfe (C, N)
18. *Spiraeopsis* (genus) (C, N)
19. *Stylidium alsinoides* R. Br. (SW) ←
- 20.* *Terminalia Supitiana* Koord. (r, N)
- 21.* *Xanthostemon celebicus* Koord. (r, SE, C, N) ←

XXII. *New Guinea-Moluccas-Celebes-Borneo* (←)

1. *Codiaeum variegatum* (L.) Bl., var. *moluccanum* (Decne.) M. A. (N, Tl; LSI, Java, not in Borneo) ←
2. *Homalium foetidum* (Roxb.) Benth. (C, SE)
3. *Nepenthes maxima* Nees (C, N)
4. *Piper amboinense* (Miq.) C. DC. (all; BNB)

XXIII. *New Guinea-Moluccas-Philippines-Celebes-Borneo* (←)

1. *Agathis* (genus) (all; Sum., Indo-Ch.) ←
2. *Aglaiia luzoniensis* Merr. & Rolfe (N; BNB)
3. *Alphitonia sisyphoides* (Spr.) A. Gray (C, Tl) ←
4. *Boerlageodendron* (genus) (N, Tl)
5. *Camptostemon* (genus) (all) (N. Austr.) ←
6. *Canarium asperum* Benth. (all; BNB)
7. *Dioscorea nummularia* Lamk. (all; BNB)

8. *Drimys piperita* Hook.f. (SW)
9. *Gnetum gnemon* L., var. *domesticum* (Rumph.) Markgr.
(SE, N, TI) ←
10. *Koordersiodendron pinnatum* (Blanco) Merr. (all; E. Born.)
11. *Paratrophis* (genus) (G; BNB) ←
12. *Phyllocladus* (genus) (C; BNB) ←
13. *Podocarpus Rumphii* Bl. (all; BNB, Soemba, Tim.)
14. *Polygonum minus* Huds., ssp. *procerum* Dans. (all; S. Phil.)
15. *Rhododendron quadrasianum* Vid. (C)
- 16.* *Tetraplasandra* (genus) (*T. Koordersii* Harms) (r, N, TI;
Pal.) ←
- 17.* *Trachymene celebica* Hemsl. (r, SW)
- 18.* „ *Sarasinorum* (Wolff) Buw. (r, SW)

XXIV. *New Guinea-Moluccas-Talaud* (ev. *Philippines*) (←)

1. *Adenia pandurata* Hall.f.
2. *Alpinia pubiflora* (Benth.) K. Schum. ←
3. *Amyema rigidiflora* (Krause) Dans.
4. *Anthocephalus macrophyllus* (Roxb.) Havil.
5. *Artocarpus communis* Forst. ←
6. *Boerlageodendron barbatum* (Becc.) Harms
- 7.* *Canthium* nov. spec. (r)
8. *Cyrtandra capitellata* Clarke
9. *Dianella coerulea* Sims ←
10. *Dolicholobium* (genus) ←
11. *Elaeocarpus dolichostylus* Schlecht.
12. *Fagraea ternatana* Miq.
13. *Hemigraphis ceramensis* Brem.
14. „ *Rumphii* Brem.
15. *Horsfieldia novo-guineensis* Warb.
16. *Hoya sussuela* (Roxb.) Merr.
17. *Hydnophytum amboinense* Becc.
18. „ *inerme* (Gaud.) Brem.
19. *Lepidagathis Robinsonii* Merr.
20. *Macropsychanthus* (genus) ←
21. *Myrtella Beccarii* F. Muell.
22. *Myxopyrum ovatum* A. W. Hill
23. *Osmelia philippina* (Turcz.) F.-Vill. ←
24. *Pandanus latissimus* Bl.
25. *Pimeleodendron amboinicum* (Miq.) Hassk.
26. *Rapanea densiflora* (Scheff.) Mez
27. *Riedelia curviflora* Oliv.
28. *Schuurmansia Theophrasta* Hall.f.
29. *Sterculia Treubii* Hochr.
30. *Styphelia moluccana* (Scheff.) J. J. S.

XXV. *Australia (New Zealand)-Lesser Sunda Islands-Celebes and Java*

1. *Gnaphalium involucratum* Forst. (SW).

E. RELATION BETWEEN REGIONAL FLORULAE AND ORIGIN.

As has been remarked above, the different parts of Celebes possess a more or less distinct floristic character. Now, it may be asked whether the regional distribution of the species in the island itself can give rise to any conclusions regarding their geographical origin. Are we able to give any definite percentages of plant species relative to the supposed land-bridges, as was done by the Sarasin's regarding the fauna?

Unfortunately, the answer is in the negative. First of all this is due to the difference inherent to the materials of phyto- and zoogeography. Of a great number of plants, the mode of dispersal is unknown or doubtful and even if a definite mode is suggested by the nature of the diaspores, we are often not certain that other possibilities are excluded. Many old oceanic islands must have been populated by ocean-crossing transport of diaspores but in many cases we fail to understand how it may have been brought about. In botany we unfortunately miss such reliable groups as the great mammals, freshwater-fishes and molluses, and earth-worms and accordingly our results have to be based upon statistics rather than upon single groups. The matter is still further entangled by the fact that even some easily dispersed groups, such as *Fungi*, Pteridophytes, Orchids, *Rhododendron*, some mangrove-species, etc. may occupy very limited areas. This phenomenon is also well-known in animals (e.g. birds) and is presumably partly due to historical, partly to ecological factors.

In the present case, however, another important point is the differences in the intensity with which botanical explorations have been carried out in the various parts of the island. As may be inferred from the list of collectors (cf. Appendix) by far the best known part is the eastern tip of the northern peninsula, the so-called Minahasa. Comparatively well-known is also SW. Celebes; but, of course, it is a general rule that the best accessible parts have the largest population and in these parts the original flora is usually most badly damaged.

Of the remaining parts, C. Celebes is the least unknown. It has recently been incidentally explored and what small collections have reached us, both from the high mountain ranges (Mt. Latimodjong, Mt. Mamboeliling, etc.) and from the plains near Malili is most promising from a phytogeographical point of view indeed.

Little known is SE. Celebes, except the islands of Boeton, Moena and Kabaena, but there, as in SW. Celebes the climate is considerably drier than in C. and N. Celebes and much of the vegetation has fallen a victim to fires.

Least known of all are E. Celebes (as long as the late Dr Eyma's collection of 1938 remains unelaborated) and the greater part of the northern Peninsula.

The following statement (*Table II*), relative to the numbers of Celebes Orchids known in 1925 and 1945 respectively, more or less truly reflects the state of our knowledge of the flora and its progress in the last twenty years.

These figures show, beside a natural decrease of the specific endemism, that, though the percentage for N has decreased and that for the other

TABLE II.

| Orchidaceae | 1925 (R. Schlechter) | 1945 (J. J. Smith) |
|--|----------------------|--------------------|
| Number of genera | 82 | 89 |
| " " species | 321 | 401 |
| Of which endemic | 253 (78.8 %) | 286 (71.3 %) |
| Number of species known from N. Celebes (Minahasa) | 251 (78.2 %) | 269 (67.1 %) |
| E. Celebes | — (0 %) | 13 (3.2 %) |
| C. Celebes | 19 (5.9 %) | 94 (23.4 %) |
| SE. Celebes | 16 (5.0 %) | 78 (19.4 %) |
| SW. Celebes | 36 (11.3 %) | 73 (18.2 %) |

parts increased since 1925, we are far from having reached a probable equilibrium. Neither could be inferred from them that N has a richer Orchid flora than, say C, or — as it probably has on account of the climate — than SW. The percentage of 67.1 for N is doubtless still largely due to our better knowledge of the Minahasa flora and it is impossible to predict to which figure this percentage will fall or which figures each of the five parts will ultimately show, when they will be equally well known to us.

In the following tables, one for the Orchids (*Table III*) and one for the "other Phanerogams" (*Table IV*), it has been indicated in which way, according to our present knowledge, the five geographical parts of the island participate in the number of species in either group. The figures in brackets () indicate the number of species only found in the region in question, the others are also known from other parts. Moreover, there is a column "all", including those species which actually have been found or may readily be expected to occur in all of the five parts. This has again been supposed to be the case when the area comprises at least SW and N. This category has been kept apart and has not been distributed to the columns for the five parts, first of all since these species have no significance to the problem of the geographical origin of the species, and also since its distribution would provide such very poorly known parts as E with relatively too high a figure (*Tables III and IV.*).

It appears from these figures that the domination of N may be very strong, even in SW area categories. For instance, out of the 59 species of such typically south-western area categories as VII and VIII of *Table III*, no less than 37 are known from N (and 29 only from N!), and only 10 from SW. On the other hand, the fact that out of the 65 species of category XIV of *Table IV* (Philippines-Celebes), 24 are unknown from N. Celebes and 22 are even only known from SW, SE or C., suggests a very imperfect knowledge of the distribution of the species in the island itself.

TABLE III

| | ORCHIDS | Number of species | Known from | | | | | |
|-----------------------|---------------------------------------|-------------------------|------------|------------|------------|----------|------------|-----|
| | | | SW | SE | C | E | N | all |
| A. | I. Sundaland-Celebes | 43 | 10 (7) | 5 (2) | 7 (4) | — | 26 (23) | 1 |
| | II. Sundal.-Phil.-Cel. | 10 | 3 (2) | 2 (1) | — | 1 (—) | 6 (6) | — |
| | III. Sundal.-Cel.-Mol. | 4 | 2 (1) | 1 (—) | — | — | 2 (2) | — |
| | IV. Sundal.-Phil.-Cel.- Mol. | 2 | — | — | — | — | 1 (1) | 1 |
| | V. Sundal.-L.S.I.-Cel. | 3 | — | — | 2 (2) | — | 1 (1) | — |
| | VI. Java-L.S.I.-Cel. | 2 | — | — | 1 (—) | — | 2 (1) | — |
| | VII. Sum.-Java-Cel. | 32 | 5 (3) | 6 (2) | 8 (6) | — | 19 (15) | — |
| | VIII. Java-Celebes | 27 | 5 (4) | 6 (2) | 5 (2) | — | 18 (14) | — |
| | IX. Sumatra-Celebes | 7 | 1 (1) | 2 (2) | 2 (—) | — | 3 (1) | 1 |
| | X. Sum.-Java-Cel.- Phil. (-L.S.I.) | 2 | 1 (—) | 1 (—) | 1 (1) | — | — | — |
| | XI. Borneo-Celebes | 8 | — | 3 (3) | 4 (1) | — | 3 (2) | 1 |
| | XII. Borneo-Phil.-Cel. | — | — | — | — | — | — | — |
| Totals Western Group | | 140 | 27 (18) | 26 (12) | 30 (16) | 1 (—) | 81 (66) | 4 |
| B. | XIII. Phil.-Cel.-L.S.I. | — | — | — | — | — | — | — |
| | XIV. Philippines-Cel. | 21 | 2 (1) | 3 (1) | 4 (4) | — | 14 (13) | — |
| | XV. Phil.-Tal. and Cel. | — | — | — | — | — | — | — |
| | XVI. Phil.-Talaud | — | — | — | — | — | — | — |
| | XVII. Talaud-Celebes | 1 | — | — | — | — | 1 (1) | — |
| Totals Northern Group | | 22 | 2 (1) | 3 (1) | 4 (4) | — | 15 (14) | — |

| | ORCHIDS | Number of species | Known from | | | | | |
|----|---|-------------------------|------------|------------|------------|----------|--------------|-----|
| | | | SW | SE | C | E | N | all |
| C. | XVIII. L.S.I.-Celebes | 4 | 2 (2) | 2 (1) | — | — | — | — |
| | XIX. Moluccas-Celebes | 28 | 4 (3) | 9 (3) | 3 (1) | — | 19 (12) | 1 |
| | XX. NG.-Mol.-Celebes | 58 | 5 (4) | 5 (3) | 11 (9) | — | 40 (37) | 1 |
| | XXI. NG.-Mol.-Phil.- Cel. | 2 | — | 1 (—) | 2 (1) | — | 1 (—) | — |
| | XXII. NG.-Mol.-Cel.- Born. | — | — | — | — | — | — | — |
| | XXIII. NG.-Mol.-Phil.- Cel. and Borneo | 1 | — | 1 (—) | — | 1 (—) | 1 (—) | — |
| | XXIV. NG.-Mol.-Talaud- (-Phil.) | 8 | — | — | — | — | 8 (8) | — |
| | XXV. Austr.-L.S.I.-Cel. and Java | — | — | — | — | — | — | — |
| | Totals Eastern Group | 101 | 11 (9) | 18 (7) | 16 (11) | 1 (—) | 69 (57) | 2 |
| | Grand-totals | 263 | 40 (28) | 47 (20) | 50 (31) | 2 (—) | 165 (137) | 6 |

TABLE IV

| | OTHER PHANEROGAMS | Number of species | Known from | | | | | |
|----|---------------------------------|-------------------------|------------|----------|------------|----------|------------|-----|
| | | | SW | SE | C | E | N | all |
| A. | I. Sundaland-Celebes | 41 | 14 (10) | 3 (1) | 16 (10) | 1 (—) | 15 (11) | — |
| | II. Sundal.-Phil.-Cel. | 40 | 12 (8) | 5 (1) | 12 (7) | 1 (—) | 13 (10) | 5 |
| | III. Sundal.-Cel.-Mol. | 9 | 1 (1) | 1 (—) | 3 (1) | — | 6 (5) | — |
| | IV. Sundal.-Phil.-Cel.- Mol. | 22 | 5 (4) | 3 (—) | 6 (1) | 1 (—) | 10 (2) | 5 |

| | OTHER PHANEROGAMS | Number of species | Known from | | | | | |
|----|---------------------------------------|-------------------------|------------|-----------|------------|----------|------------|-----|
| | | | SW | SE | C | E | N | all |
| A. | V. Sundal.-L.S.I.-Cel. | 6 | 4 (2) | 1 (—) | 1 (—) | — | — | 2 |
| | VI. Java-L.S.I.-Cel. | 17 | 11 (7) | 6 (1) | 2 (1) | — | 2 (1) | 2 |
| | VII. Sum.-Java-Cel. | 7 | 3 (3) | — | — | — | 2 (2) | 2 |
| | VIII. Java-Celebes | 8 | 4 (4) | — | 2 (2) | — | 2 (2) | — |
| | IX. Sumatra-Celebes | 2 | — | — | 2 (2) | — | — | — |
| | X. Sum.-Java-Cel.- Phil. (-L.S.I.) | 5 | 3 (1) | — | 2 (—) | — | 2 (2) | — |
| | XI. Borneo-Celebes | 15 | 1 (1) | 2 (2) | 8 (7) | — | 5 (4) | — |
| | XII. Borneo-Phil.-Cel. | 6 | 1 (1) | — | 1 (1) | — | 3 (3) | 1 |
| | Totals Western Group | 178 | 59 (42) | 21 (5) | 55 (32) | 3 (—) | 60 (42) | 17 |
| B. | XIII. Phil.-Cel.-L.S.I. | 4 | 2 (1) | — | 1 (—) | — | — | 2 |
| | XIV. Philippines-Cel. | 65 | 13 (10) | 7 (4) | 14 (8) | — | 38 (32) | 2 |
| | XV. Phil.-Tal. and Cel. | 9 | — | 1 (—) | 3 (—) | — | 8 (4) | 1 |
| | XVI. Phil.-Talaud | 26 | — | — | — | — | 26 (26) | — |
| | XVII. Talaud-Celebes | 12 | — | 1 (—) | 1 (—) | — | 8 (8) | 3 |
| | Totals Northern Group | 116 | 15 (11) | 9 (4) | 19 (8) | — | 80 (70) | 8 |

| | OTHER PHANEROGAMS | Number of species | Known from | | | | | |
|----|---|-------------------------|------------|------------|-------------|----------|--------------|-----|
| | | | SW | SE | C | E | N | all |
| C. | XVIII. L.S.I.-Celebes | 9 | 3 (2) | 5 (3) | 2 (1) | — | — | 1 |
| | XIX. Moluccas-Celebes | 31 | 1 (1) | 3 (1) | 8 (4) | — | 22 (16) | 3 |
| | XX. NG.-Mol.-Celebes | 32 | 3 (2) | 2 (2) | 19 (17) | 1 (1) | 8 (7) | 1 |
| | XXI. NG.-Mol.-Phil.- Cel. | 21 | 3 (2) | 1 (—) | 4 (—) | — | 12 (9) | 6 |
| | XXII. NG.-Mol.-Cel.- Born. | 4 | — | 1 (—) | 2 (—) | — | 2 (1) | 1 |
| | XXIII. NG.-Mol.-Phil.- Cel. and Borneo | 18 | 3 (3) | 1 (—) | 4 (3) | — | 5 (3) | 7 |
| | XXIV. NG.-Mol.-Talaud- (-Phil.) | 30 | — | — | — | — | 30 (30) | — |
| | XXV. Austr.-L.S.I.-Cel. and Java | 1 | 1 (1) | — | — | — | — | — |
| | Totals Eastern Group | 146 | 14 (11) | 13 (6) | 39 (25) | 1 (1) | 79 (66) | 19 |
| | Grand-totals | 440 | 88 (64) | 43 (15) | 113 (65) | 4 (1) | 219 (178) | 44 |

F. APPLICATION OF REGIONAL COEFFICIENTS.

However this may be, both tables show that, in the totals of each of the three main area-groups, N has absolute preponderance. Only in the western group (A) of Table IV it is almost equal to SW. The question arises, is there any possibility of neutralizing the effect of the greater numbers in the better known districts so as to render the figures for the five parts of the island more or less equivalent?

As far as I can see there are two solutions to this problem. In both, the figures for N, as the best known district, have to be considered the nearest approach to stability and therefore as a basis regarding those for the other parts.

Now, in order to make the numbers for all parts equivalent, two ways can be followed; either the grand-totals for N in the Tables III and IV are to be accepted as a basis for a proportional regional coefficient or the percentage of the Orchids in N. Celebes as shown in Table II. A draw-

back of the first method is that the material is biased insofar as only phytogeographically important areas are involved. Furthermore, the proportional coefficient thus obtained for the E. peninsula would become so large as to greatly overvalue its figure. A drawback of the Orchid method is that the material is biased insofar as only one natural group is involved. Advantages, however, are that the Orchids probably show little regional differentiation and that the figures for E are much less exaggerated.

We have, therefore, given preference to the last-named procedure, by which the four regional coefficients may be calculated as follows ($N = 1$):

$$SW - 67.1 : 18.2 = 3.7$$

$$SE - 67.1 : 19.4 = 3.5$$

$$C - 67.1 : 23.4 = 2.9$$

$$E - 67.1 : 3.2 = 21.$$

(Tables V and VI).

Applying these coefficients to the totals of Tables III and IV (repeated underneath in *Table V*) we obtain the following results (*Table VI*).

Although it is obvious that this method is far from perfect — e.g. in group A of *Table VI* (other Phanerogams) the number of species thus obtained (218) is considerably higher than the actual one (178) — it is striking that in the western group the domination evidently lies in SW and C, in the northern group it remains in N, and in the eastern group it convincingly comes to C (standing for the unknown E. peninsula).

This seems to agree with the Sarasin's conclusion of a Java-bridge, a Philippine bridge and a Moluccan bridge. We may add to this that even in *Table IV* the preponderance of SW in the categories V—VIII (Southern Sundaland, Less. S. Isl. and Celebes) is striking and also that of N in category XIX (Mol.-Cel.) and of C in category XX (New Guinea-Cel.). A most striking evidence is also given by the northern group, particularly by the categories XIV—XVII, in which N very strongly prevails.

Regarding the Orchids the proportions are somewhat different. Of the western group SW still leads, but it is remarkably little ahead of SE, C and N. Particularly striking in *Table III* are the figures for the western categories VII and VIII, in which N is strongly dominating. This may be partly due to our better knowledge of that region, partly, however, it may be an illustration of an assumption, uttered by Schlechter, that, as far as the Orchids are concerned, Celebes has to be considered a phytogeographical unity. This might be due to the relative independence of Orchids from land connections.

In the northern group N leads normally, but of the eastern group the preponderance lies with N, instead of C. This gives some support to Schlechter's statement that the relations of the N. Celebes Orchids mainly point eastward and particularly to New Guinea. However, his assertion that the Orchid flora of Celebes should be of a mixed nature "in dem aber die papuasischen Typen vorherrschen", is not confirmed by our knowledge of today and is to be considered the expression of an ever returning psychological mistake of botanists who, accustomed to a Western-Malaysian flora, on a slight eastward move expect (and hope) to find that much discussed and not easily attainable eastern element suddenly dominating.

TABLE V.
Totals of Tables III and IV.

| Other Phanerogams | | | | | | | | | |
|-------------------|--------------|----------------|----|----|----|---|-----------|--------------|----------------|
| Oreheids | Geogr. group | Numb. of spec. | SW | SE | C | E | N | Geogr. group | Numb. of spec. |
| | A. West | 140 | 27 | 26 | 30 | 1 | 81 | A. West | 178 |
| | B. North | 22 | 2 | 3 | 4 | — | 15 | B. North | 116 |
| | C. East | 101 | 11 | 18 | 16 | 1 | 69 | C. East | 146 |
| | Total | 263 | | | | | | Total | 440 |

TABLE VI.
Figures of Table V after application of the regional coefficients.

| Other Phanerogams | | | | | | | | | |
|-------------------|--------------|----------------|------------|-----------|----|----|-----------|--------------|----------------|
| Oreheids | Geogr. group | Numb. of spec. | SW | SE | C | E | N | Geogr. group | Numb. of spec. |
| | A. West | 140 | 100 | 91 | 87 | 21 | 81 | A. West | 178 |
| | B. North | 22 | 7 | 11 | 12 | — | 15 | B. North | 116 |
| | C. East | 101 | 41 | 63 | 46 | 21 | 69 | C. East | 146 |
| | Total | 263 | | | | | | Total | 440 |

To try and extract more detailed conclusions from our data would in our opinion, be preposterous and presumptuous. It seems impossible at the time being, to give any procentual figures for the shares contributed to the Celebes flora by each of the bridges, as was done by the Sarasin's regarding the fauna, let alone to state the percentage of an eventual "old Asiatic element".

G. "ANOMALOUS" AREAS.

As has been stated above, most of the older investigators considered the Macassar Straits a very strong or even an absolute barrier to W.-E. or E.-W. migrations. The numerous plants connecting Celebes and the Sundaland were, in most cases, also found either in the Philippines or in the Lesser Sunda Islands or in both regions and it was therefore generally accepted that the above assumption was holding good for the Macassar Straits proper and that the migrations had passed Wallace's Line either north or south of it, or both.

However, in 1932 Van Steenis pointed out that there are a rather considerable number of groups which defy what was once considered a rule of general validity. He enumerates 16 genera, both of eastern and of western origin, belonging to 10 different families and each elucidated by an area map, which cross the Straits of Macassar without being known either from the Lesser Sunda Islands or from the Philippines. Van Steenis's attention was drawn to this "anomalous" category of areas by his study of the Malaysian *Styracaceae*, a typically continental family of which 6 species have penetrated into the Malay Peninsula and Sumatra (and 1 also into West-Java) and two are extending as far as New Guinea. These two, *Styrax agrestis* G. Don and *Bruinsmia styracoides* Boerl. & Koord. are known from Annam to New Guinea and from Sumatra to New Guinea respectively, being unknown from the Philippines (sometimes excluding Palawan) and the Lesser Sunda Islands. The mode of dispersal is not self-evident (animals?), but it is probably slow.

Next to these two Van Steenis enumerates the following cases:

Soulamea (*Simarubaceae*), woody, monotypic. Borneo to Solomon Islands (lowlands). Of eastern origin. Mode of dispersal unknown.

Bromheadia (*Orchidaceae*), herb. Indo China to New Guinea (lowlands). Of western origin. Wind dispersal.

Schima (*Ternstroemiaceae*), woody. In Malaysia one or some few closely related species. Asia and Formosa to Palawan, Borneo, Celebes and West-Java (mountains). Of western origin. Mode of dispersal unknown.

Rhodamnia (*Myrtaceae*), woody. In Malaysia one species from Asia to Australia (lowlands to 1000 m). Of eastern origin. Wind dispersal.

Prainea (*Moraceae*), woody. Malay Peninsula, Sumatra, Borneo, Halma-hera. Origin and mode of dispersal unknown. Perhaps not generically different from *Artocarpus*.

Deplanchea (*Bignoniaceae*), woody. Malay Peninsula and Sumatra to N.E. Australia. Of eastern origin, two species in the Sundaland. Wind dispersal.

Mastersia (*Leguminosae*), liana. India to New Guinea (one species). Of western origin. Mode of dispersal unknown.

Baeckea frutescens L. (*Myrtaceae*), woody. Australia to Asia. Of eastern origin. Wind dispersal.

Melaleuca (*Myrtaceae*), woody. One species from Australia to Malay Peninsula. Of eastern origin. Mode of dispersal unknown.

Pericopsis (*Leguminosae*), woody. Ceylon to Moluccas and Talaud. Of western origin. Mode of dispersal unknown.

Barclaya (*Nymphaeaceae*), aquatic plant. Asia to Malay Peninsula, Sumatra and Borneo, also in New Guinea. Origin and mode of dispersal unknown.

Sloetia (*Moraceae*), woody. India to Celebes. Of western origin. Dispersal by animals.

Lepironia (*Cyperaceae*), herb. One species from Madagascar to Fiji from sealevel to about 1100 m alt. Origin and mode of dispersal unknown.

Claderia (*Orchidaceae*), herb. Sumatra to New Guinea. Origin unknown. Wind dispersal.

It is obvious that these instances are of very different phytogeographical value. They have very little in common but that none of them is known from the Philippines proper (Palawan sometimes excluded), from the Lesser Sunda Islands (except *Melaleuca* in Timor) and from C. and E. Java. Only in 4 out of the 16 cases mentioned the area includes a small portion of W. Java, a region which is considered to belong phytogeographically to Sumatra rather than to Java proper.

In connection with the results of the present paper, we may add to Van Steenis's list the following data:

1. Our area-category XI (Borneo-Celebes) with 23 species (12 endemic). The 8 Orchids not mentioned above are:

1. **Adenoncos celebicus* Schlecht. (r; N)
2. * " *macranthus* Schlecht. (r; C)
3. **Apostasia celebica* J. J. S. (r; SE)
4. **Arachnis celebica* (Schlecht.) J. J. S. (r; all)
5. **Cystorchis celebica* Schlecht. (r; C, N)
6. **Dipodium Ferrellii* J. J. S. (r; SE)
7. *Habenaria damaiensis* J. J. S. (N)
8. **Nephelaphyllum laciniatum* J. J. S. (r; SE)

2. Our area category III (Sundaland-Celebes-Moluccas) with 13 species (2 endemic).

The 4 Orchids not mentioned above are:

1. *Bulbophyllum odoratum* Lindl. (Malay Peninsula, Borneo, Java, Celebes, Amboina, Boeroe).
2. * " *Steffensii* Schlecht. (r)
3. * " *tylophorum* Schlecht. (r)
4. *Sarcanthus subulatus* (Bl.) Reichenb. f. (India and Indo China, Malay Peninsula, Batoe, Sumatra, Borneo, Java, Celebes, Amboina, Boeroe, Ceram).

3. Our area category XXII (New Guinea-Moluccas-Celebes-Borneo) with 5 species.

The Pteridophyte not mentioned above is:

1. *Tapeinidium moluccanum* (Bl.) C. Chr.

4. Six species of our area category I (Sundaland-Celebes) which do not occur in Java and have therefore probably not reached Celebes by means of the Java-bridge. They are:
 1. *Blastus Cogniauxii* Stapf
 2. *Nepenthes gracilis* Korth.
 3. *Otanthera celebica* Bl.
 4. *Palaquium obovatum* (Griff.) Engl.
 5. *Pouteria malaccensis* (Clarke) Baehni
 6. *Santiria laevigata* Bl.
 5. The following species mentioned by Van Steenis and not inserted in one of our lists:
 1. *Dendrobium Lobbii* T. et B. (syn. *D. calcaratum* Lindl., *D. conostalis* Reichenb. f., *D. Teysmannii* Miq.) (Siam, Singapore, Sumatra, Bangka, ? Borneo, Celebes, closely related to other species from these regions and from New Guinea).
 2. *Gnetum macrostachyum* Hook. f. (Malay Peninsula, Sumatra, W. Java, Borneo, New Guinea).
 3. *Nepenthes ampullaria* Jack (Malay Peninsula, Sumatra, Borneo, New Guinea)
 6. One Orchid of our area category XIX (Moluccas-Celebes):
 1. *Trichoglottis geminata* (T. et B) J. J. S. (also in Borneo).
More or less to the same group belong:
 7. One Orchid species of our area category XXIV (New Guinea-Moluccas-Talaud):

**Microstylis talaudensis* J. J. S. (r; also related to N. Celebes species).
 8. Our area category XVII (Talaud-Celebes) with 13 species (1 endemic). The Orchid not mentioned above is:
Microstylis trigonopetala J. J. S.
 9. Certain species of our area categories XIX (Moluccas-Celebes) and XX (New Guinea[-Moluccas]-Celebes), viz. inasfar as they have probably not reached Celebes by means of the Moluccan bridge. Notably this might be assumed for such species as are only occurring in (known from) N. Celebes (38 endemic).
- Cat. XIX. Orchids:
1. *Bulbophyllum amplebracteatum* T. et B.
 2. „ *klabatense* Schlecht.
 3. *Dendrobium concavum* J. J. S.
 4. * „ *mirandum* Schlecht. (r)
 5. „ *Rumphianum* T. et B.
 6. **Luisia celebica* Schlecht. (r)
 7. *Pomatocalpa Koordersii* (Rolfe) J. J. S.
 8. *Saccolabium Rumphii* J. J. S.
 9. *Trichoglottis Koordersii* Rolfe (but related to Philippine species)
 10. **Vanda celebica* Rolfe (r)
 11. **Zeuxine viridiflora* J. J. S. (r)
- Other Phanerogams:
1. *Albizzia Minahassae* Koord.
 - (¹) also in Talaud) 2. *Amomum roseum* (T. et B.) Benth. & Hook.¹⁾

3. *Buchanania amboinensis* Miq.
4. *Diospyros Rumphii* Bakh. ¹⁾
5. *Elatostema polioneurum* Hall. f. ¹⁾
6. *Ficus adenosperma* Miq.
7. *Hemigraphis stenophylla* Hall. f.
8. *Homalium minahasae* Koord.
9. *Itoa Stapfii* (Koord.) Sleum.
10. *Medinilla crispata* (L.) Bl.
11. " *ternatensis* Miq.
12. *Mischophloeus paniculatus* (Scheff.) Scheff. ¹⁾
13. *Polyscias Rumphiana* Harms (also in Timor) ¹⁾
14. *Schuurmansia elegans* Bl.

Cat. XX. Pterid.:

1. *Dipteris novo-guineensis* Posth.

Orchids:

1. **Agrostophyllum simile* Schlecht. (r)
2. **Bulbophyllum aberrans* Schlecht. (r)
3. * " *codonanthum* Schlecht. (r)
4. * " *subuliferum* Schlecht. (r)
5. **Cheirostylis quadrilobata* Schlecht. (r)
6. **Dendrobium amblyogenium* Schlecht. (r)
7. " *confusum* Schlecht.
8. * " *cultratum* Schlecht. (r)
9. * " *Eickhardtoides* Schlecht. (r)
10. * " *masarangense* Schlecht. (r)
11. * " *parvulum* Rolfe (r)
12. " *rhpidolobum* Schlecht.
13. * " *sororium* Schlecht. (r)
14. * " *speculigerum* Schlecht. (r)
15. * " *stenophyton* Schlecht. (r)
16. * " *suaveolens* Schlecht. (r)
17. **Dipodium gracile* Schlecht. (r)
18. **Epiblastus masarangicus* (Kraenzl.) Schlecht. (r)
19. **Eria oreogana* Schlecht. (r)
20. * " *rhizophoreti* Schlecht. (r)
21. **Glomera celebica* (Schlecht.) J. J. S. (r)
22. **Malleola Steffensii* J. J. S. et Schlecht. (r)
23. **Microstylis klabatensis* Schlecht. (r)
24. * " *mambulilingensis* J. J. S. (r)
25. * " *trichopoda* Schlecht. (r)
26. * " *umbraticola* Schlecht. (r)
27. **Oberonia celebica* Schlecht. (r)
28. **Pholidota celebica* Schlecht. (r)
29. **Phreatia klabatensis* Schlecht. (r)
30. **Podochilus Minahassae* Schlecht. (r)
31. * " *truncatus* J. J. S. (r)
32. *Sarcochilus platyphyllus* F. v. M.
33. **Taeniophyllum ficicola* Schlecht. (r)
34. *Thrixspermum Loogemanianum* Schlecht.
35. * " *tylophorum* Schlecht. (r)

36. **Vanilla platyphylla* Schlecht. (r)
37. **Vrydagzynea celebica* Schlecht. (r)
38. **Zeuxine Minahassae* Schlecht. (r)

Other Phanerogams: 1. *Canarium oleosum* Engl. (also in Timor)
 2. *Gnetum gnemon* L., var. *silvestre* (Brongn.) Parl.¹⁾
 (1) also in Talaud 3. *Gomphandra australiana* F. Muell.¹⁾
 4. *Medinilla crassinervia* Bl.
 5. " *rosea* Gaud. (also in Marianas)
 6. *Vernonia lanceolata* (Warb.) Mattf.¹⁾

Altogether the "anomalous" group comprises some 16 genera (many of which, however, represented by only one or by a few species) and more-over 135 species (of which 2 Pteridophyta and 65 Orchids), with areas which are not in accordance with our current views on migration tracks on account of geologically justified connections. Of these 135 species, however, 54 (of which 48 Orchids) are endemics whose insertion in a certain area category is based upon relationship. If these are left out there are, beside Van Steenis's 16 genera, 81 species (of which 2 Ferns and 17 Orchids), say about 100 species. This seems a group too numerous to be ignored. Yet, much of its importance is lost on considering its heterogeneity. Unless we know much more about the species concerned we are utterly unable to produce any satisfactory theory towards the explanation of these anomalous areas. What we have to do to this purpose is to investigate for each individual species its probable mode of dispersal and as much of its taxonomical and geographical history as possible. We have merely mentioned the above species as an extension to Van Steenis's list and in order to draw the attention of future investigators to these interesting areas. Van Steenis failed to discover any common element to his 16 genera and though unable to offer any explanation, seems inclined to look for a possible common feature in the mode of dispersal. To us, however, it seems, provisionally, that there are a great many possibilities such as:

1. A species may belong to an ancient, e.g. Tertiary flora and it (or its direct ancestors) may have reached the island in times when the land and sea configuration may have been entirely different compared with the present one. This possibility seems not to have occurred to Van Steenis. Still it means that a species belongs to what is often called an "old invasion". Curiously enough, this term is always thought of in connection with Asia. Never, or very rarely, it is applied to the eastern element and though this is undoubtedly much poorer and probably also provided with less favourable communications than the western one, it should not be entirely neglected. Accordingly, every species of this group, and possibly many others, are to be checked as to whether or not they may belong to an ancient family, the distribution of which may be naturally incoherent with present conditions.
2. It is possible that a species has disappeared from a region which nowadays is considered a former land connection. For instance, it might be suggested that some species which are now lacking in Java or are found only in West-Java, have vanished, as, in fact, has been

proved by certain fossils (*Dryobalanops* and *Shorea* in West-Java. Such an event may have been caused by geological actions as well as by the activities of man.

3. An "anomalous" area may have been brought about by
 - a. polytopic origin,
 - b. chance dispersal.
4. An "anomalous" area may merely be an incompletely known one, which on account of subsequent discoveries will appear to become a perfectly "normal" one.

These considerations seem sufficient to prevent any premature and far-reaching conclusions. We therefore leave this matter to future investigators and will summarize our views on the phytogeography of Celebes in the following conclusions.

3. CONCLUSIONS (cf. *Fig. 4*).

From earlier as well as from the present investigations the following conclusions may be drawn:



Fig. 4 — Principal migration tracks in and around Celebes; the weaker ones have been indicated by broken lines, doubtful ones by an additional interrogation mark, main tracks somewhat heavier than secondary ones.

1. Phytogeography differs greatly from Zoogeography both in methods and results. Owing to our lack of knowledge concerning the modes of dispersal and the apparent want of certain species being restricted to definite modes of dispersal, the results of Historical Phytogeography are often much less reliable than those of Zoogeography. They have often to be obtained by statistical rather than by direct methods. Before really trustworthy conclusions may be expected, great numbers of species will have to be checked relative to their possible taxonomical and geographical history. Special attention should be given as to whether or not land-connections are probably essential regarding the dispersal. Mountain (alpine) species should be considered separately, as they are probably more independent of former landbridges than low-land species are.
2. Ancient invasions of plants into Celebes, either from the West or from the East, as have been assumed for the fauna, may have taken place, but are as yet unproved. Species with "anomalous" areas (cf. point 10) as well as many others should be checked as to their possible belonging to any of these ancient flora stocks.
3. Of the supposed "younger" infiltrations — whose age, for lack of paleobotanic research, is by no means proved either —, several may be well in accordance with the Sarasin's land-bridges, though the nature of the material does not allow such (apparently) well-founded procentual proportions as have been given regarding the fauna.
4. As has been illustrated by *Fig. 4* the main outside connections of the Celebes flora are a number of migration tracks which have been constructed on account of plant areas and checked with the results of geological research.
5. Most distinct is the Philippine track. Representatives of this element have probably entered through the Sangihe Islands chain, albeit possibly in a different configuration. This is suggested by geological research but phytogeographically it cannot be proved on account of the fact that the flora of these young-volcanic islands is very strongly influenced by the dense population, and that its vestiges have never been thoroughly investigated.

Although there are a number of species (cf. point 10) which are only known from Talaud and N. Celebes, it is, on geologic grounds, not probable that a direct migration track from Mindanao to Celebes has run through these islands. A strong track, however, runs from New Guinea and the Northern Moluccas via Talaud to the Philippines v.v. (cf. Holthuis and Lam, l.c.) and it may be assumed that many of its species have reached Celebes through Sangihe, though they meanwhile may have disappeared — e.g. by recent volcanic, tectonic or human action — or have not yet been discovered there.

Representatives of the Philippine element have penetrated very far down south. Many species have even reached C. or SW. Celebes (25 and 13 out of 65 species of our area category XIV respectively), which may mean either that — inasfar as land-connections were essential for them — they have very recently arrived, or that a land-

connection between SW. and C. has existed during a longer period or for more numerous times than has thusfar been assumed by geologists.

6. Another fairly distinct track is that between Java and SW. Celebes, though its influence up north is distinctly weaker (8 out of 45 species of our area categories V—X reached N. Celebes) than that of the Philippine element in the south. Again its course is difficult to reconstruct owing to the lack of our knowledge of the original forest flora of Salajar e.a., which moreover is apparently of a recent date and partly strongly influenced by man (cf. Docters van Leeuwen, l. c.). Geological research suggests that it runs through the Salajar archipelago and Kangean and as far as the flora of the latter islands is concerned this is phytogeographically supported (*Canarium commune* L., Moluccas to Kangean!).

Although the present study does not deal particularly with mountain plants — whose dispersal is, as a rule, less dependent from land-connections than that of lowland plants — it should be reminded here that Van Steenis (1936) has clearly shown the importance of the Java-track for SW. Celebes. The flora of this region — particularly the Peak of Bonthain flora — is “less markedly Asiatic than (that of) the Lesser Sunda Islands”; out of 44 temperate species, “clearly belonging to some track”, 59 % belonged to the Java track, 23 % to the Philippine track and 18 % to the Moluccan (New Guinea) track. The representatives of the northern and the eastern elements increase rapidly — perhaps even suddenly — in number as one moves northward and this marks the floristic boundary between SW en C. Celebes, also alluded to in the present study. It is possibly though by no means proved as yet that this boundary coincides with the so-called Tempe-depression. In 1938 (p. 732) Van Steenis rightly produced the Philippine track southward so as to include the whole of SW. Celebes.

At present it seems impossible to discriminate between eventual representatives of a Java track and a Flores track. Much more detailed research is needed to enable such a subtle conclusion.

7. The relations to the Moluccas are much more confused. This is mainly due to our very scanty knowledge of the flora of the Banggai Archipelago and of E. Celebes. As it is, the Moluccan and Papuan elements (area categories XIX and XX) seem to be manifesting themselves mainly in two districts, C. and in N. Celebes. Whilst the former district, in view of our very imperfect knowledge of the E. Celebes flora, may be supposed to represent the outcome of a Central Moluccan track, the Moluccan and Papuan relations of N. Celebes (without intermediary of the Philippines) are still insufficiently explained (cf. points 5 and 10). A thorough investigation of C. and E. Celebes is urgently needed and we may look forward with high expectations to the results of the late Dr Eyma's exploration of 1938.
8. As has already been pointed out by Hallier, there are so far no phytogeographical indications that SE. Celebes has ever been inhabited from the Lesser Sunda Islands. This is in accordance with the results of geological research. It looks as if the flora of this peninsula is entirely

hailing from C. Celebes, through which it may have got its representatives of the western, northern and eastern elements.

9. The main connection between Borneo and Celebes seems to have run through the Philippines. As has been pointed out by Merrill, the islands of Palawan, Culian and Busuanga belong to the Sunda-shelf rather than to the Philippines proper and this land-bridge seems to have been interrupted at an early date between the last-named island and Mindoro. The main track probably runs via the Sulu-bridge and Mindanao, where it joins the Philippine track. Another possible but as yet obscure connection might be supposed in the extreme south, where it, some time, may — or may not — have joined the Java track. This suggestion is to a certain degree supported by the submarine configuration (cf. *Fig. 2*); for the time being, it cannot be proved phytogeographically.
10. A not inconsiderable number of areas do not comply with the above rules, based upon geologically justified area categories. They are mainly referring to two connections, for which no geological basis has been found, viz. that between Borneo and Celebes without an intermediary of the Philippine- or the Java-bridge, and that between the Moluccas (and Talaud) and Celebes without an intermediary of the Philippines or the Lesser Sunda Islands. This group of areas, however, is too heterogeneous to suggest a general cause or to necessitate a fundamental change in the above rules. A thorough investigation as to the individual taxonomical and geographical histories of the species involved is needed before the importance of this group as such can be judged. More particularly their eventual belonging to one of the "ancient invasions" (cf. point 2) should be considered.

Literature.

1. ABENDANON, E. C., Historische Geologie van Midden-Celebes — *Tijdschr. Kon. Ned. Aardr. Gen.* 1917, 440—456, 548—564.
2. BEVERSLUIS, A. J., Iets over de samenstelling, verspreiding, gesteldheid en be-
nutting der bosschen in het landschap Boeton e.a. — *Tectona* XII, 1919, 513—
528, with map.
- 2a. BLOEMBERGEN, S., Verslag van een exploratietocht naar Midden-Celebes (Lindoe-
meer en Goenoeng Ngilalaki ten Zuiden van Paloe) in Juli 1939 — *Tectona* 32,
1940, 377—418.
3. BLUMEA I — hodie.
4. BULLETIN DU JARDIN BOTANIQUE DE BUITENZORG, Sér. III, I — hodie.
5. CHRIST, H., Die Farnflora von Celebes — *Ann. Jard. bot. de Buitenz.* XV,
1898, 73—186.
6. —, Zur Farnflora von Celebes II — *Filices sarasinianae itineris secundi* — *Ann.*
Jard. bot. Buitenz. 2e Sér., 4, 1904.
7. DOCTERS VAN LEEUWEN, W. M., Botanical results of a trip to the Salajar
Islands — *Blumea* 2, 1937, 239—277.
8. HALLER, H., Die Zusammensetzung und Herkunft der Pflanzendecke Indonesiens,
in: J. ELBERT, Die Sunda-Expedition des Ver. f. Geogr. u. Stat. II, 1912,
275—302.
9. HERINGA, P. K., Rapport over de begroeiing van de Sangi- en Talaud-eilanden —
Tectona XIV, 1921, 733—746.

10. —, Rapport over de begroeiing van de onderafdeelingen Posso en Parigi van de Afdeling Midden-Celebes speciaal met het oog op de bosschen en houtstand, vergezeld enz. — *Tectona* XIV, 1921, 795—810.
11. HOLTHUIS, L. B. and H. J. LAM, A first contribution to our knowledge of the Flora of the Talaud Islands and Morotai — *Blumea* 51, 1942, 93—256.
12. KOORDERS, S. H., Verslag eener botanische dienstreis door de Minahassa, tevens eerste overzicht der Flora van N. O. Celebes uit een wetenschappelijk en praktisch oogpunt. — *Med. 's Lands Plantentuin* XIX, 1898, 1—716.
13. —, Supplement op het Eerste Overzicht der Flora van N. O. Celebes — I, § 1 (1918), § 2 (1920); II (1922); III (1922).
14. KOPPEL, C. v. D., Winning van copal in het gouvernement Celebes en Onderhoorigheden, de uitvoer hiervan uit Makassar, en eenige details over het gebruik van copal — *Tectona* XIX, 1926, 525—574, with coloured map.
15. —, De rotan van Celebes — *Tectona* XXI, 1928, 61—94 with 9 photographs and 1 map.
16. LAM, H. J., Phylogeny of the Malaysian Burseraceae-Canarieae — *Blumea* 3, 1938, 126—158, esp. p. 142 ss.
17. —, c.s., Contributions to our knowledge of the Flora of Celebes (Coll. C. MONOD DE FROIDEVILLE) and of some other Malaysian islands — *Blumea* V³, 1945, 554—599. —, v. HOLTHUIS.
18. MERRILL, E. D., The correlation of biological distribution with the geological history of Malaysia — *Proc. Pan-Pacif. Sci. Congress Australia* 1923 (1926), 1148—1155.
19. —, Distribution of the Dipterocarpaceae — *Phil. Journ. Sci.* 23, 1923, 1—32.
20. —, An Enumeration of Philippine Flowering Plants — 4, 1926, p. 77—154, esp. 96—97, 127—154.
21. —, Some Malaysian Phytogeographical Problems — *Gardens' Bull., Straits Settl., Vol. IX, Part I, Dec. 1935*, 49—57.
22. POSTHUMUS, O., Die Pteridophyten der Elbert'schen Sunda-Expedition — *Med. 's Rijks Herbarium Leiden* no. 70, 1933.
23. RENSCH, B., Die Geschichte des Sundabogens. Eine tiergeographische Untersuchung — Berlin, Gebr. Borntraeger, 1936.
24. SARASIN, P. & F., Materialien zur Naturgeschichte der Insel Celebes III. Ueber die geologische Geschichte von Celebes auf Grund der Thierverbreitung — 1901, Wiesbaden.
25. —, Reisen in Celebes. Ausgeführt in den Jahren 1893—1896 und 1902—1903 — Wiesbaden, C. W. Kreidel, 1905, 2 vol.
26. SCHLECHTER, R., Die Orchidaceen der Insel Celebes — *Fedde's Repert. spec. nov. regni veg.* 21, 1925, 113—212.
27. SMITH, J. J., The Orchidaceae of Dr. W. KAUDERN's expedition to Selebes 1917—1920 — *Svensk Bot. Tidskr.* 20, 1926, 470—482.
28. —, Additions to the Orchid-flora of Selebes — *Bull. du Jard. bot. de Buitenzorg, Sér. III, Vol. X*, 1928, 1—24.
29. —, Orchidaceae selebensenses kjellbergianae (Selebes-Expedition 1929) — *Engler's Botan. Jahrbücher* 65, 1933, 449—508.
30. STEENIS, C. G. G. J. VAN, The Styracaceae of Netherlands India — *Bull. Jard. bot. Buitenz., Sér. III, Vol. XII*, 1932, 254—264.
31. —, On the origin of the Malaysian Mountain Flora — Part. 1, *Bull. du Jard. bot. de Buitenzorg, Sér. III, Vol. XIII²*, 1934, 135—262 (partic. p. 149); Part 2, *Ibid. XIII³*, 1935, 289—417 (partic. p. 356 ss.); Part. 3, *Ibid. XIV¹*, 1936, 56—72.
32. —, Exploraties in de Gajo-landen. Algemeene resultaten der Losir-Expeditie 1937 — *Tijdschr. Kon. Ned. Aardr. Gen.*, 2e Ser., 45, 1938, 728—801.
33. STEUP, F. K. M., Bijdragen tot de kennis der bosschen van Noord- en Midden-Celebes (I). Het ebbenhout in de onderafd. Poso — *Tectona* XXIII, 1930, 857—873.
34. —, Bijdragen tot de kennis der bosschen van Noord- en Midden-Celebes II. Een verkenningstocht door Midden-Celebes — *Tectona* XXIV, 1931, 1121—1135.
35. —, Bijdragen tot de kennis der bosschen van Noord- en Midden-Celebes III. Het zgn. tjempaka-hoetan complex in de Minahassa — *Tectona* XXV, 1932, 119—147.

36. —, Bijdragen tot de kennis der bosschen van Noord- en Midden-Celebes IV. Over de boschgesteldheid in de onderafdeelingen Bolaang Mongondow — Tectona XXVI, 1933, 26—49.
37. —, Botanische aantekeningen over Noord-Celebes — De Trop. Nat. 22, 1933, 109—111.
38. —, Botanische aantekeningen over Noord-Celebes II — De Trop. Nat. 23, 1934, 61—63.
39. —, Het ebbenhout in den dienstkring Manado — Tectona XXVIII, 1935, 45—65.
40. —, De lasi-bosschen van de onderafdeeling Boalemo — Tectona XXVIII, 1935, 95—107.
41. —, Botanische aantekeningen over Noord-Celebes III — De Trop. Nat. 24, 1935, 186—189.
42. —, Botanische aantekeningen over Noord-Celebes IV — De Trop. Nat. 25, 1936, 29—31.
43. —, Vegetatieschetsen uit Celebes — De Trop. Nat., Jub. uitg. 1936, 41—45.
44. VERHOEF, L., Bijdragen tot de kennis der bosschen van Noord- en Midden-Celebes. V. Het boschgebied Ongkak Doemoga (Bolaang Mongondow) — Tectona XXXI, 1938, 7—29.
45. WARBURG, C., Die Flora des Asiatischen Monsungebietes. Eine pflanzengeschichtliche Studie — Verhandl. Ges. D. Nat.f. u. Aertze, 1890, Allg. Teil, 3—19.

APPENDIX.

List of the principal botanical collectors in Celebes.

(pro = on behalf of)

Southwest-Celebes.

- H. A. B. BÜNNEMEIJER — Bonthain c.a. (III—VI. 1921).
 W. M. DOCTERS VAN LEEUWEN — Makasar, Salajar, Djampea, Bonerate, Kajoeado, Kalaotoa (V. 1913).
 FORESTRY EXPERIMENT STATION (pro) — Bonthain, Salajar.
 C. MONOD DE FROIDEVILLE (XII. 1937—IV. 1939)
 NOERKAS and RACHMAT (pro L. VAN VUUREN) — Makasar, Bone, Balangnipa, Lake Tempe, Takalar (IV. 1912—VII. 1913).
 P. and F. SARASIN — Peak of Maros (VI—VII. 1895), Lompobatang (IX—XI. 1895), div. loc. (IV—VII. 1902; XII. 1902—II. 1903).
 J. E. TEYSMANN, 1877 — Pare-pare (VII), Pangkadjene (VII—VIII), Balehangin near Maros (IX), Maros and Boeloe-boeloe (IX), Bonthain (X), Salajar (XI—XII).
 L. VAN VUUREN, see under NOERKAS and RACHMAT.
 O. WARBURG — Peak of Bonthain c.a. (Balangnipa¹), Bikeroe, Tasoso, Manipi, Tjamba, Maros) (XI—XII. 1888).
 H. ZOLLINGER — Makasar c.a., Salajar (VII. 1847).

Other collectors in this region are:

- BARCLAY (Makasar); O. BECCARI (Makasar—XII. 1873—I. 1874); Mrs. A. BOUMAN—HOUTMAN (Makasar, Djenepono, c.a.); BRÄUTIGAM (Bone; pro HEYNE¹); F. B. DUTRIEUX (Makasar; 1937); A. H. EVERETT (Peak of Bonthain); P. J. EYMA (Malino; 1939¹); (pro) K. HEYNE; J. B. HOMBRON (Makasar; V. 1839); G. K. KJELLBERG (Makasar,

¹) Balanipa, according to W. in "Monsunia" I, 1900, p. VII. According to Van Vuuren's map, the orthography should be Balangnipa, unless the Balanipa District in Mandar-Madjene is meant instead of, as I think is the case, the coastal village in Bonthain-Sindjai.

Bonthain; III and VI. 1929; I. 1930); J. A. LÖRZING (Malino); M. PICICELLI (III. 1914); O. POSTHUMUS, 1930, 1932 (i.a. Malino); A. RANT (Makasar, Malino; X. 1931); (pro) G. E. RUMPHIUS (Makasar, end 17th century); SCHAEPMAN (Peak of Bonthain); R. SCHLECHTER (Makasar; XI. 1909 and II. 1910); TENGWALL (Pirang and Saädang Valley; IX. 1924); TOLSON (Gowa); A. R. WALLACE (1856, 1857); MAX WEBER (1889); J. VAN ZIJLL DE JONG (1933).

Southeast-Celebes.

O. BECCARI — Kendari (II—VIII. 1874).
 J. ELBERT, 1909 — Toekang Besi (VII), Moena (VII—VIII), Kolaka (G. Mengkoka) and Roembia (IX), Kabaëna (X), Boeton (VIII, IX and XI).
 FORESTRY EXPERIMENT STATION (pro) — Boeton, Moena, Kabaëna, Saloeang.
 C. GRÜNDLER (pro J. ELBERT) — Kabaëna (X. 1909).
 HAM — Moena.
 HEINRICH — G. Mengkoka (Kolaka).
 W. A. KAUDERN — Kolaka (VI. 1919).
 G. K. KJELLBERG, 1929 — Boeton and Moena (II), Kendari, Kolaka, Watoewila (II—IV).
 C. MONOD DE FROIDEVILLE (XII. 1937—IV. 1939).
 NOERKAS and RACHMAT (pro L. VAN VUUREN) (VIII. 1912—I. 1914).
 P. and F. SARASIN — Moena, Kendari, Mengkoka (II—III. 1903).
 L. VAN VUUREN, see under NOERKAS and RACHMAT.

Central-Celebes.

S. BLOEMBERGEN — Lindoe-lake and G. Ngilalaki (Paloe) (VII. 1939).
 P. J. EYMA and C. G. G. J. VAN STEENIS — G. Latimodjong c.a. (1937).
 P. J. EYMA — Lake Matano and L. Poso c.a. (1938).
 FORESTRY EXPERIMENT STATION (pro) — Malili, Oesoe, Parigi, Paloe, Donggala.
 W. A. KAUDERN, 1918 — Paloe, Koelawi, Koro, Kantewoe (IX), Bada, Poso, Mori.
 G. K. KJELLBERG, 1929 — Enrekang c.a. (V), Palopo (VI—VII), Todjamboe (VII), Malili and Towoeti-lake c.a. (VIII—XII).
 C. MONOD DE FROIDEVILLE (XII. 1937—IV. 1939).
 NOERKAS and RACHMAT (pro L. VAN VUUREN) — Madjene, Enrekang, Mamoedjoe, Mandar (Polewali), Loewoe (Belandai), Palopo, Tomori (VI. 1912—XI. 1913).
 P. and F. SARASIN — Palopo to Poso (I—III. 1895, Oesoe to Tomori (II—III. 1896), Paloe to Palopo (VII—XI. 1902), Enrekang c.a. (VII—VIII. 1895).
 C. G. G. J. VAN STEENIS, see under P. J. EYMA.
 F. K. M. STEUP (pro FORESTRY EXPERIMENT STATION) — Paloe, Poso (1929—1933).
 L. VAN VUUREN, see under NOERKAS and RACHMAT.

Other collectors in this region are:

E. C. ABENDANON (1910—1911); LE COCQ D'ARMANDVILLE (Malili); GÄUMANN (Palopo, X. 1921); pro K. HEYNE (Loewoe, Poso); PESIK (Paloe, XI. 1928); O. POSTHUMUS (Paloe, Lindoe-lake, XI. 1930); R. SCHLECHTER (Donggala; XI. 1909 and II. 1910); C. G. G. J. VAN STEENIS (Saadang-valley, VI. 1937).

East-Celebes.

W. A. KAUDERN — Loewoek, Banggai Isl. [(1917?)—1920].
 P. J. EYMA — G. Loemoet, Loewoek, Wana distr. (1938).

North-Celebes.

FORESTRY EXPERIMENT STATION (pro) — Minahasa, Kwandang, Boalemo, Gorontalo.
 E. A. FORSTEN — Minahasa (V—IX, 1840).
 C. HOSE — Minahasa (1894—1895).
 W. A. KAUDERN — Bolaang Mongondow, Minahasa: Goeroepahi (III—XII. 1917; I. 1919; II. 1920).
 S. H. KOORDERS — Minahasa (XII. 1894—V. 1895).

- H. J. LAM, 1926 — Minahasa (IV), Talaud Isl. (V—VI).
C. G. C. REINWARDT — Minahasa (Amoerang, G. Klabat, G. Lokon) and Gorontalo (IX—XI, 1821).
J. G. F. RIEDEL — Minahasa, Gorontalo (1864—1875 → ?).
R. SCHLECHTER — Minahasa, Toli-toli, Paleleh, Bolaang Itang, Sangkoep (XI. 1909—II. 1910).
F. C. and H. F. STEFFENS (pro —, pro R. SCHLECHTER) — Minahasa (1909—1911).
F. K. M. STEUP (pro FORESTRY EXPERIMENT STATION) — Minahasa, Bolaang Mongondow, Boalemo (1931—1936).
P. and F. SARASIN — Minahasa (VI—XI. 1893; I—VIII. 1894; IX—XI. 1894; III—V. 1895), Gorontalo (XI. 1893—I. 1894; III. 1895), Boeol to Marissa (VIII—IX. 1894).
J. E. TEYSMANN and W. H. DE VRIESE — Minahasa (beginning 1860).
O. WARBURG — Minahasa (VIII. 1888).

Other collectors in this region are:

Asst. Vet.-Surgeon of Gorontalo (Gorontalo, 1928); W. J. D. VAN ANDEL (Boeol); BEHAGEL (Gorontalo); HEES (Gorontalo, 1900); H. A. GUSDORF pro K. HEYNE; E. J. JELLESMA (1892—1903); G. KARSTEN (1889); T. S. A. KNIJFF (Minahasa); KRUYFF (Minahasa); P. A. LESSON (Minahasa; VII—VIII. 1828); WL. ROTHERT (Gorontalo, V. 1909); E. DE LA SAVINIERRE (Minahasa, ± 1877); J. J. SMITH (Minahasa, 1900); General DE VOOGT (Paleleh); VORDERMAN (VI. 1897); A. R. WALLACE (VI—IX. 1859); WISSE.

PLANTAE A TH. HERZOGIO IN ITINERE EIUS BOLIVIENSI ALTERO
ANNIS 1910 ET 1911 COLLECTAE

Pars VII¹⁾

(Ed. die XXXI m. decembri 1945)

Nachtrag zu EUPHORBIACEAE.

(Vergl.: Mededeelingen van 's Rijksherbarium, Leiden, n. 40, 1921, S. 29)

(TH. HERZOG, Jena).

Euphorbia duriuscula Pax et K. Hoffm., spec. nov.

Tota breviter scabrido-pilosa. Radix multiceps. Caules 12—20 cm alti, adscendentes vel erecti, inferne microphyllini, demum defoliati, striati. Folia alterna, brevissime petiolata, infima circa 3 mm diametentia, firma, subtus purpurascentia, superiora sensim accrescentia, ad 1.5 cm longa, 12 mm lata, orbiculari-ovata, basi et apice obtusa, apiculata, firma; floralia sterilibus similia et vix majora. Umbellae radii 3—5. Cyathium pedunculo ad 2 mm longo suffultum, extus brevissime, intus longe pilosum; lobi apice laciniati; glandulae 4, extus subtruncatae, supra concavae; bractee florum ♂ longe pilosae. Styli fere ad medium bilobi, cruribus apice capitatis. Capsula circa 3 mm longa, 5 mm lata, breviter pilosa. Semina circa 3 mm longa, dorso carinata, ecarunculata, grisea, rubro-maculata.

Comarapa, auf den höchsten Bergwiesen, 2600—2800 m alt., n. 1916.

Verwandt mit *E. erythrorrhiza* Boiss., von ihr unterschieden durch die Form und Grösse der Blätter und durch die abweichende Behaarung.

COMPOSITAE.

(JOSÉPHINE TH. KOSTER, Leiden).

Pars Compositarum huius syllogae (ex parte ad interim) determinatae erant a botanicis diversis. In Th. Herzogii "Die Pflanzenwelt der bolivischen Anden und ihres östlichen Vorlandes, Die Vegetation der Erde 15, 1923", nonnullae ex his determinationibus publici iuris factae sunt, nomine non addito eius, qui determinavit. Ex schedulis, plantis adiunctis, efficiendum est, cuius determinationes sint.

VERNONIEAE.

Vernonieas determinaverunt E. L. Ekman, 1914 (partim) et J. Mattfeld, 1932. Determinationes eorum cum meis congruunt, *Vernonia fulva* excepta.

¹⁾ Vide "Mededeelingen van 's Rijksherbarium Leiden" n. 19, 27, 29, 33, 40 et 46.

Vernoninae.

Vernonia Schreb.

Sectio *Lepidaploa* (Cass.) Hoffm. in Engler et Prantl, Nat. Pfl. Fam. 4, 5, 1894, 126.

Vernonia rubricaulis Humb. et Bonpl., Pl. Aequin. 2, 1809, 66 t. 99; H. B. K., Nov. Gen. 4, 1820, 26; Lessing in Linnaea 4, 1829, 299; DC., Prodr. 5, 1836, 46; Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 79; Grisebach in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 162; Hieronymus in Engl. Bot. Jahrb. 22, 1897, 688; 28, 1900, 559; Chodat in Bull. Herb. Boiss. Sér. 2, 2, 1902, 302; R. E. Fries in Ark. f. Bot. 5, 1906, 4; Arechavaleta, Fl. Urug. 3, 1906, 112; Hassler in Trab. Mus. Farmac. Med. de Buenos Aires 21, 1909, 122; Hicken, Chlor. Plat. Argent., 1910, 237; Heering in Schellenberg, Schinz, Thellung in Mem. Soc. Neuchâtel Sci. Nat. 5, 1913, 416; Knuth in Fedde, Repert. Beih. 43, 1928, 693; Gleason in Amer. Journ. of Bot. 10, 1923, 300; Ekman in Herzog, Pfl. boliv. And., 1923, 115; Malme in Ark. f. Bot. 24 A, 1932, 11.

Hab.: an feuchten Stellen der Pampa von Santa Cruz, 450 m alt., Febr. 1911, n. 1523.

Distr.: Columbia, Venezuela, Brasilia, Bolivia, Paraguay, Argentina, Uruguay.

Vernonia scorpioides Pers. var. ***sororia*** (DC.) Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 101; Hieronymus in Engl. Bot. Jahrb. 22, 1897, 698; Chodat in Bull. Herb. Boiss. Sér. 2, 2, 1902, 303; Hassler in Trab. Mus. Farmac. Med. de Buenos Aires 21, 1909, 122 — *Vernonia sororia* DC., Prodr. 5, 1836, 40 — an *Vernonia paulina* Gdgr in Bull. Soc. Bot. de France 65, 1918, 47 ?

Hab.: im Gebüsch um Samaipata, 1700 m alt., März 1911, Bl. purpurn, n. 1670.

Distr.: Brasilia, Paraguay, Argentina occidentalis.

Vernonia squamulosa Hook. et Arn. in Hooker, Comp. Bot. Mag. 2, 1836, 44; Grisebach in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 165; Hieronymus in Engl. Bot. Jahrb. 22, 1897, 701; Gleason in Amer. Journ. of Bot. 10, 1923, 304; Ekman in Herzog, Pfl. boliv. And., 1923, 148.

Hab.: kleiner Strauch am Abstieg von Samaipata ins Mairanathal, 1700 m alt., März 1911, Bl. hellrosa, n. 1780.

Distr.: Bolivia, Argentina borealis.

Vernonia fulta Griseb. in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 164; Hieronymus in Engl. Bot. Jahrb. 22, 1897, 677; R. E. Fries in Ark. f. Bot. 5, 1906, 4; Gleason in Amer. Journ. of Bot. 10, 1923, 309 — *Vernonia senecionaefolia* Britton (fide Gleasonii) in Bull. Torrey Bot. Club 18, 1891, 331 — *Vernonia trixioides* Rusby (fide Hieronymi) in Mem. Torrey Bot. Club 6, 1896, 54; Buchtien, Contr. Fl. Boliv. 1, 1910, 188 — *Vernonia Herzogii* Ekman in Herzog, Pfl. boliv. And., 1923, 189.

Hab.: kletternd im Bergwald bei Tablas, 2200 m alt., Mai 1911, Bl. lila, n. 2166.

Distr.: Bolivia, Argentina borealis.

Obs.: Specimina, quae compararentur, praesto non erant, sed diagnosis speciei congruebat.

f. tomentosa Koster, nov. f.

Pars superior caulis, folia superiora in nervis subtus et squamae involucri ferrugineo-tomentosae, folia supra scabra.

Hab.: kletternd im feuchten Wald, des unteren Coranithales, circa 1800 m alt., Mai 1911, Bl. lila, n. 2152.

Vernonia Kuntzei Hieron. in Engl., Bot. Jahrb. 22, 1897, 678; Gleason in Amer. Journ. of Bot. 10, 1923, 303 — *Composita* n. 1816 Herzog, Pfl. boliv. And., 1923, 139.

Hab.: im subalpinen Gebüsch bei Pojot, 2500 m alt., April 1911, n. 1816/a; Bergtriften der Cuesta de los Monos, 1400 m alt., Mai 1911, Bl. purpurn, n. 1698, n. 1816.

Distr.: Bolivia.

Vernonia setososquamosa Hieron. in Engl., Bot. Jahrb. 22, 1897, 684.

Hab.: auf der Pampa von Santa Cruz, durch Viehbeweidung verkrüppelt, 450 m alt., Jan. 1911, n. 1499; in den Hügelcampos von Florida, 800—900 m alt., Dez. 1910, n. 1297.

Lychnophorinae.**Elephantopus** L.

Elephantopus angustifolius Schwartz, Prodr., 1788, 115, Fl. Ind. Occ. 3, 1806, 1383; Lessing in Linnaea 4, 1829, 327; Schultz-Bip. in Linnaea 20, 1847, 517; Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 176; Grisebach in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 166; Rusby in Mem. Torrey Bot. Club 3, 1893, 51; Hieronymus in Engl. Bot. Jahrb. 22, 1897, 704; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 145; Hieronymus in Engl., Bot. Jahrb. 29, 1900, 3; Pilger in Engl., Bot. Jahrb. 30, 1901, 201; Chodat in Bull. Herb. Boiss., Sér. 2, 1, 1901, 411; 2, 1902, 305; Chodat et Hassler eodem 3, 1903, 640; Arechavaleta, Fl. Urug. 3, 1906, 127 t. 19; Hassler in Trab. Mus. Farmac. Med. de Buenos Aires, 21, 1909, 122; Herzog, Pfl. boliv. And., 1923, 224; Knuth in Fedde, Repert. Beih. 43, 1928, 695; Malme in Ark. f. Bot. 24 A, 1932, 23; Bornmueller in Rev. Sudamer. Bot. 2, 1935, 38; Moore in Fawcett et Rendle, Fl. Jamaica 7, 1936, 164; Koster in Pulle, Fl. Surin. 4, 1938, 103.

Hab.: in der Pampa von Santa Cruz, 450 m alt., Jan. 1911, Bl. weisslich lila, n. 1307.

Distr.: America tropica et subtropica.

Obs.: Forma minor, plantae breves, 12—30 cm altae; folia parva, radicalia 4—12 cm, caulina 1½—3½ cm longa; spicae non vel parce ramosae.

EUPATORIEAE.

Ex *Eupatorieis* species generum *Ophryospori*, *Trichogoniae*, *Eupatorii*, et *Mikaniae* B. L. Robinson, probabiliter 1914—1923, fere omnes determinavit, parte minore a E. L. Ekmanio, 1913, et W. Heeringio, 1913, determinata. Determinationes eorum, duabus horum exceptis, cum meis congruunt. Numeri 1501/a, 1750 et 1769 adhuc determinati non erant. Genus *Stevia* partim a G. Beauverdio tractatum est, cuius determinationes omnes a meis differunt.

Piquerinae.

Ophryosporus Meyen

Sectio *Ophryochaeta* Robinson in Contr. Gray Herb. Harv. Univ. N. S. 32, 1906, 20.

Ophryosporus piquerioides (DC.) Benth. ex Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 188; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 165; Hieronymus in Engl., Bot. Jahrb. 36, 1905, 463; Robinson in Contr. Gray Herb. Harv. Univ. N. S. 32, 1906, 23; Rusby in Bull. N. Y. Bot. Gard. 4, 1907, 381; Weberbauer, Pfl. peruan. And., 1911, 247 — *Eupatorium piquerioides* DC., Prodr. 5, 1836, 175; Sch.-Bip. in Bull. Soc. Bot. de France 12, 1864, 79; Sch.-Bip. in Linnaea 18, 1865—1866, 535.

Hab.: Strauch des subalpinen Gebüsches am Berg über Vallegrande, 2400 m alt., März 1911, n. 1926.

Distr.: Peruvia, Bolivia, Chili, Argentina.

Ophryosporus Cumingii Benth. ex Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 188; Robinson in Contr. Gray Herb. Harv. Univ. N. S. 32, 1906, 25.

Hab.: Halbstrauch im Gebüsch um Incaconal, 2500 m alt., Juni 1911, Bl. cremeweiss, n. 2210.

Distr.: Bolivia.

Ageratinae.

Stevia Cav.

Sectio *Eustevia* Robinson in Contr. Gray Herb. Harv. Univ. N. S. 100, 1932, 20.

Stevia prob. **filipes** Rusby in Bull. N. Y. Bot. Gard. 8, 1912, 126; Robinson in Contr. Gray Herb. Harv. Univ. N. S. 100, 1932, 45 — *Stevia boliviensis* Beauverd (non Sch.-Bip.) in Herzog, Pfl. boliv. And., 1923, 137, 138.

Hab.: in der Buschregion von Tres Cruces (Cordillere de Santa Cruz), 1500 m alt., Febr. 1911, n. 1548.

Distr.: Bolivia.

Obs.: Specimina, quae compararentur, praesto non erant. Differt forma foliorum. Folia in specimine Herzogii late ovata, $1\frac{1}{2}$ —3 cm longa, $1\frac{1}{2}$ —2 cm lata. Setae pappi adelphocarpiorum 3.

Stevia prob. **Stuebelii** Hieron. in Engl., Bot. Jahrb. 21, 1895, 328; Robinson in Contr. Gray Herb. Harv. Univ. N. S. 100, 1932, 46 — *Stevia amplexicaulis* Beauverd (non Hassler) in Herzog, Pfl. boliv. And., 1923, 144, 150; Robinson in Contr. Gray Herb. Harv. Univ. N. S. 100, 1932, 65.

Hab.: auf subalpinen Wiesen der Abra de la Senda, 2100 m alt., März 1911, Bl. purpurn, n. 1829.

Distr.: Bolivia.

Obs.: Specimina, quae compararentur, praesto non erant. Differt foliis sessilibus, ovatis vel rhomboideo-ovatis, supremis ovato-lanceolatis, squamis involucri apice longe acutis. Folia caulium aliorum parva, $1\frac{1}{2}$ — $3\frac{1}{2}$ cm longa, 1—2 cm lata, aliorum maiora, 5— $6\frac{1}{2}$ cm longa, $2\frac{1}{2}$ — $3\frac{1}{2}$ cm lata.

Stevia copiosa Koster, nov. spec. (fig. 1, a—l).

Herbacea, plus quam $\frac{1}{2}$ m alta, erecta, prolifera in axillis foliorum. Caulis teres, obscure striatus, brunneus, crispe griseo-pubescent, 2—3 mm crassus, internodiis 1—5 cm longis. Folia opposita (inflorescentiae alterna), sessilia, ovata vel rhomboideo-ovata vel (praesertim superiora) elliptica (plurima in specimine Herzogii corrosa), apice subobtusa vel obtusa, basi abrupte vel gradatim longe attenuata, petiolum plerumque unilateraliter alatum formantia, parte superiore crenata vel subintegra, inferiore integra, chartacea, pinninervia, nervis prominentibus subtilis, reticulatione obscura, utrinque breviter et sparse pubescentia, glandulosa, subtus pallidiora, 2—7 cm longa, 1—2½ cm lata, superiora minora. Inflorescentia tenuis, laxe corymboso-paniculata, elongata, foliosa, ad 40 cm longa, 20 cm lata, ramulis tenuissimis, crispe griseo-, parte superiore glanduloso-pubescentibus, circa $\frac{1}{2}$ mm crassis, in axillis foliorum minorum. Capitula breviter vel longiuscule pedunculata, pedunculo tenui, ad basin vel in medio saepe bractea minuta praedito, glanduloso-pubescenti, involucro plerumque multo brevior, 0—4 mm longo, interdum sessilia, 2 vel 3 in apice ramulorum, 5-flora, cylindrica, 9—10 mm longa, circa 2 mm crassa; involucri cylindricum, 5—6 mm longum, squamis 5, oblongo-lanceolatis, apice acutis, striatis, glanduloso-pubescentibus,



Fig. 1 — *Stevia copiosa* Koster, nov. spec. a: ramulus inflorescentiae ($\times 1$); b: folium inferior ($\times 1$); c: capitulum ($\times 3$); d: flos ($\times 3$); e—i: capituli achenia omnia ($\times 3$); k: anthera ($\times 10$); l: stylus ($\times 5$).

Bevelander del.

saepe purpurascens. Flores bisexuales, 11 mm longi, corolla tubulosa, apice 5-lobata, tubo $5\frac{1}{2}$ mm longo, lobis oblongis, apice acutis, extrinsecus pubescentibus, 1 mm longis. Antherae basi obtusae, apice appendiculatis, appendice obtusa. Styli rami (rariter 3) longi, tenues, obtusi. Achenium turbinato-oblongum, 5-costatum, costis scabridis, nigrescens, 4 mm longum; pappus 4 vel 3 adelphocarpiorum ex 3—7 squamis membranaceis, laciniatis, $\frac{1}{2}$ mm longis, pluribus protractis in setas scabras, saepe purpurascens, corollam longitudine aequantes, idiocarpium vel idiocarpiorum 2 ex squamis membranaceis, circa $\frac{1}{2}$ mm longis, laciniatis, quarum saepe una protracta in setam ut in pappo adelphocarpiorum, interdum etiam altera paullo elongata. Receptaculum parvum, nudum.

Hab.: in der Dornbuschsteppe zwischen Pulquina arriba und Comarapa, 1900 m alt., April 1911, Bl. hellrosa, n. 1800.

Obs.: In clavem *Steviarum* boliviensium, quam Robinson composuit (Robinson in Contr. Gray Herb. Harv. Univ. N.S. 100, 1932, 39), haec species non facile insereri potest, propter inflorescentiam laxam et pedunculos involucri breviore.

Stevia vaccinioides Koster, nov. spec. (fig. 2, a—g).

Parva, subfruticosa, probabiliter viscosa, 20—30 cm alta, parte inferiore, 4—7 cm longa, ramis carens, rhizomatibus praedita, parte superiore confertim ramosa, ramis numerosis, divaricatis, saepe paene directis, saepe elongatis; radicibus copiosis, circa 1 mm in diam. Caulis teres, obscuriter striatus, glanduloso-hirsutus, interdum purpurascens, $1\frac{1}{2}$ —2 mm crassus; internodiis partis inferioris 3—12 mm, partis superioris et ramorum 5—22 mm longis. Folia opposita, sessilia, parva, elliptica, basi gradatim attenuata, apice subobtusata vel subacuta, parte inferiore integra, parte superiore maiore serrata, subcoriacea, firma, saepe lucida, olivacea (in sicco), utrinque dense glanduloso-punctata, subtus in nervis glanduloso-hirsuta, trinervia (subpinninervia), nervis prominentibus subtus, reticulatione insignii, 1— $2\frac{1}{2}$ cm longa, 3—10 mm lata, superiora minora. Inflorescentia laxissime corymbosa, diffusa, bracteis foliaceis, ellipticis vel lanceolatis minutis ad basin ramorum praedita. Capitula numerosa, cylindrica, longe pedunculata, pedunculo filiformi, rigido, glanduloso-hirsuto, saepe purpurascens, elongato, 3—15 mm longo, interdum bractea minuta praedito, 5-flora, 11 mm longa, 2 mm crassa; involucrium cylindricum, 7—9 mm longum; squamis 5, lanceolatis, apice acutis vel acuminatis, longitudine inaequalibus, striatis, glanduloso-hirsutis. Flores bisexuales, 11 mm longi; corolla tubulosa, glandulosa, apice 5-lobata, tubo 5— $5\frac{1}{2}$ mm longo, lobis oblongis, apice obtusis et mucronatis, extrinsecus pubescentibus, 1— $1\frac{1}{2}$ mm longis. Antherae basi subacutae, apice appendiculatae, appendice obtusa, Styli rami longi, tenues, apice acuti. Achenium turbinato-oblongum, 5-costatum, glabrum, nigrescens, $3\frac{1}{2}$ mm longum; pappus omnium acheniorum similis ex 3—4 paleis latis, apice laciniatis, membranaceis, vix 1 mm longis, et ex 3—4 setis corollam longitudine aequantibus, basin versus dilatatis, scabris. Receptaculum parvum, planum, nudum.

Hab.: an Felsen des "Fuerte" bei Samaipata, circa 1900 m alt., März 1911, Bl. weiss, n. 1770.

Obs.: In clavem *Steviarum* boliviensium, quam Robinson composuit (Robinson in Contr. Gray Herb. Harv. Univ. N.S. 100, 1932, 39), haec

species insereri potest prope *S. urticaefoliam* Billb. var. *pallidifloram* Robinson, a qua differt indiciiis pluribus i. a. pappi.

Sectio *Breviaristatae* Robinson in Contr. Gray Herb. Harv. Univ. N. S. 100, 1933, 20.

Stevia boliviensis Sch.-Bip. ex Grisebach in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 166; Britton in Bull. Torrey Bot. Club 18, 1891, 333; Rusby in



Fig. 2 — *Stevia vaccinioides* Koster, nov. spec. a: planta florescens ($\times \frac{1}{2}$); b: folium ($\times 2$); c: capitulum ($\times 3$); d: flos ($\times 3$); e: achenium ($\times 3$); f: apex styli ($\times 5$); g: anthera ($\times 10$).

Mem. Torrey Bot. Club 3, 1893, 51; Robinson in Contr. Gray Herb. Harv. Univ. N. S. 100, 1932, 57 — *Stevia nepetaefolia* Beauverd (non HBK.)

in Herzog, Pfl. boliv. And., 1923, 143, 144, 146; Robinson in Contr. Gray Herb. Harv. Univ. N. S. 100, 1932, 66.

Hab.: auf Bergwiesen um Samaipata, gemein, 1600—1900 m alt., März 1911, Bl.rosa, n. 1720; im Gebüsch um Samaipata, circa 1700 m alt., März 1911, Bl. weiss, n. 1659.

Distr.: Bolivia, Argentina.

Seetio *Multiaristatae* DC., Prodr. 5, 1836, 122.

Stevia samaipatensis Robinson in Contr. Gray Herb. Harv. Univ. N. S. 96, 1931, 15; 100, 1932, 60 — *Stevia multiaristata* Beauverd (non Spreng.) in Herzog, Pfl. boliv. And., 1923, 143, 146; Robinson in Contr. Gray Herb. Harv. Univ. N. S. 100, 1932, 66.

Hab.: Triften der Bergkämme um Samaipata, 1950—2000 m alt., März 1911, Bl. hellrosa, n. 1712.

Distr.: Bolivia.

Obs.: Specimina, quae compararentur, praesto non erant. Diagnosis speciei in universum optime congruebat. Attamen folia 2—3 mm lata, pappus idiocarpii squamosus, ut in diagnosi, sed una seta, 5 mm longa, praeditus.

Stevia sarensis Robinson var. ***dissiticeps*** Robinson in Contr. Gray Herb. Harv. Univ. N. S. 100, 1932, 62 — *Stevia* n. 1468 Herzog, Pfl. boliv. And., 1923, 114, 115.

Hab.: an Wegrändern bei Santa Cruz, 450 m alt., Jan. 1911, n. 1468.

Distr.: Bolivia.

Stevia tarijensis Hieron. in Engl., Bot. Jahrb. 40, 1908, 362; Robinson in Contr. Gray Herb. Harv. Univ. N. S. 100, 1932, 65 — *Stevia Bangii* Beauverd (non Rusby) in Herzog, Pfl. boliv. And., 1923, 228.

Hab.: aus steinigem trockenem Boden am Cerro de Oruro, 3800 m alt., Nov. 1911, n. 2522 d.

Distr.: Bolivia.

Trichogonia Gardn.

Trichogonia capitata (Rusby) Robinson in Contr. Gray Herb. Harv. Univ. N. S. 39, 1911, 193 — *Eupatorium capitatum* Rusby in N. Y. Bot. Gard. 4, 1907, 380.

Hab.: im Gebüsch bei Samaipata, circa 1700 m alt., März 1911, Bl. hellrosa, n. 1667.

Distr.: Bolivia.

Eupatorium L.

Seetio *Cylindrocephala* DC., Prodr. 5, 1836, 141.

Eupatorium congestum Hook. et Arn. in Hooker, Comp. Bot. Mag. 1, 1835, 239; Hieronymus in Engl., Bot. Jahrb. 22, 1897, 760; Herter, Estud. Bot. Urug. 4, 1930, 120; Malme in Kungl. Sv. Vet. Akad. Handl. ser. 3, 12, 1933, 35; Bornmueller in Rev. Sudamer. Bot. 2, 1935, 39 — *Eupatorium tozziaefolium* DC., Prodr. 5, 1836, 146; Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 297; Chodat et Hassler in Bull. Herb. Boiss. Sér. 2, 3, 1903, 706; Arecavaleta, Fl. Urug. 3, 1906, 151 — var. *tozziaefolium* Hassler in Fedde, Repert. 14, 1916, 282.

Hab.: Bolivia, s. n.

Distr.: Brasilia, Argentina, Paraguay, Uruguay.

Eupatorium hirsutum Hook et Arn. var. ***genuinum*** Hassler in Fedde,

Repert. 14, 1916, 283 — *Eupatorium hirsutum* Hook. et Arn. in Hooker, Comp. Bot. Mag. 1, 1835, 239; Hieronymus in Engl., Bot. Jahrb. 22, 1897, 758; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 147; Hicken, Chlor. Plat. Argent., 1910, 240; Usteri, Fl. São Paulo, 1911, 252; Herter, Estud. Bot. Urug. 4, 1930, 119; Bornmueller in Rev. Sudamer. Bot. 2, 1935, 39 — *Eupatorium trichophorum* DC., Prodr. 5, 1836, 147 — *Eupatorium bartsiaefolium* DC. var. *trichophora* Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 295; Arechavaleta, Fl. Urug. 3, 1906, 151.

Hab.: Hügelle Campos von Porongo, 550 m alt., Jan. 1911, n. 1501/a.

Distr.: Brasilia, Argentina, Paraguay, Uruguay.

Obs.: Folia subchartacea, superiora apice longe acuminata.

Eupatorium Arnottianum Griseb. in Abh. Kön. Ges. Wiss. Gött. 19, 1874, 119; 24, 1879, 169; Hieronymus in Engl., Bot. Jahrb. 22, 1897, 746; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 147; Robinson in Contr. Gray Herb. Harv. Univ. N. S. 61, 1920, 39; Ekman in Herzog, Pfl. boliv. And., 1923, 115.

Hab.: am Wegrund bei Santa Cruz, 450 m alt., Jan. 1911, Bl. helllila, n. 1474.

Distr.: Bolivia, Argentina.

Eupatorium desmocephalum Robinson in Contr. Gray Herb. Harv. Univ. N. S. 68, 1923, 14.

Hab.: an felsigen Abhängen des Cuesta de Guayabillas, 1200 m alt., März 1911, Bl. lila, n. 1739.

Section *Chromolaena* (DC.) Benth. apud Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 300.

Eupatorium austerum Robinson in Contr. Gray Herb. Harv. Univ. N. S. 68, 1923, 9.

Hab.: in der Buschregion von Tres Cruces, 1500 m alt., Febr. 1911, n. 1610.

Obs.: Robinson specimen nostram in sectione *Cylindrocephalis* collocavit; receptaculum autem hemisphaericum, paleaceum (non planum, nudum), paleis oblanceolatis inter flores. Ergo haec species pertinet ad sectionem *Chromolaenam*, adhuc ex Brasilia tantum cognitam. In clave sectionis *Chromolaenae*, quam Robinson (in Contr. Gray Herb. Harv. Univ. N. S. 104, 1939, 14) composuit, haec species prope *E. horminoides* Baker collocanda est. Capitula huius speciei, quae examinavi, erant circa 35-flora.

Section *Subimbricata* (DC.) Hoffm. in Engler et Prantl, Nat. Pfl. Fam. 4, 5, 1894, 140.

Eupatorium buniifolium Hook. et Arn. in Hooker, Comp. Bot. Mag. 1, 1835, 240; Hieronymus in Engl., Bot. Jahrb. 22, 1897, 773; R. E. Fries in Ark. f. Bot. 5, 1906, 8; Hicken, Chlor. Plat., Argent., 1910, 239; Robinson in Contr. Gray Herb. Harv. Univ. N. S., 61, 1920, 45; Ekman in Herzog, Pfl. boliv. And., 1923, 143, 146 — *Eupatorium pinnatifidum* DC., Prodr. 5, 149; Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 320; Arechavaleta, Fl. Urug. 3, 1906, 155; Herter, Estud. Bot. Urug. 4, 1930, 120.

Hab.: Charakterstrauch mit hängenden Ästen auf trockenen Berggriften bei Samaipata, 1900 m alt., März 1911, Bl. rötlich lila, n. 1674.

Distr.: Brasilia australis, Bolivia, Argentina, Uruguay.

Eupatorium bupleurifolium DC., Prodr. 5, 1836, 149; Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 332 t. 87; Hieronymus in Engl., Bot. Jahrb. 22, 1897, 777; Chodat in Bull. Herb. Boiss., Sér. 2, 2, 1902, 308; Arechavaleta, Fl. Urug. 3, 1906, 160; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 57;

Robinson in Contr. Gray Herb. Harv. Univ. N.S. 61, 1920, 46; Herter, Estud. Bot. Urug. 4, 1930, 119; Bornmueller in Rev. Sudamer. Bot. 2, 1935, 39 — var. *serrulatum* Sch.-Bip. in Herzog, Pfl. boliv. And., 1923, 151.

Hab.: bäumchenförmiger Strauch im subalpinen Gebüsch des Berges über Valleggrande, 2400 m alt., März 1911, Bl. lila, n. 1861.

Distr.: Brasilia, Bolivia, Argentina, Uruguay.

Obs.: Folia ad 15 cm lata. Var. *serrulatum* Sch.-Bip. non distinguenda est, fide Robinsonii l. c.

Eupatorium crenulatum Spreng. ex Hieron. in Engl., Bot. Jahrb. 22, 1897, 776; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 147; Hicken, Chlor. Plat. Argent., 1910, 240; Weberbauer, Pfl. peruan. And., 1911, 238; Robinson in Contr. Gray Herb. Harv. Univ. N.S. 60, 1919, 64; 61, 1920, 47; Malme in Ark. f. Bot. 24 A, 1932, 28; Malme in Kungl. Sv. Vet. Akad. Handl., ser. 3, 12, 1933, 39; Bornmueller in Rev. Sudamer. Bot. 2, 1935, 39 — *Eupatorium dendroides* Heering (non Spreng.) in Herzog, Pfl. boliv. And., 1923, 141.

Hab.: Charakterstrauch des Buschregion bei Tres Cruces, 1450 m alt., März 1911, n. 1692.

Distr.: Peruvia, Bolivia, Brasilia, Argentina.

Eupatorium santacruzense Hieron. in Engl., Bot. Jahrb. 22, 1897, 762; Robinson in Contr. Gray Herb. Harv. Univ. N.S. 61, 1920, 51.

Hab.: Strauch im Thal des Rio Comarapa, 2000 m alt., April 1911, Bl. weiss, n. 1876.

Distr.: Bolivia.

Eupatorium eucosmum Robinson in Contr. Gray Herb. Harv. Univ. N.S. 61, 1920, 6, 53.

Hab.: Strauch im subalpinen Gebüsch des Berges über Valleggrande, 2400 m alt., März 1911, Bl. lila, n. 1858.

Distr.: Bolivia.

Eupatorium endytum Robinson in Contr. Gray Herb. Harv. Univ. N.S. 60, 1919, 13; 61, 1920, 55.

Hab.: im Gebüsch der Jungas von San Mateo, 1700 m alt., April 1911, n. 2011.

Distr.: Peruvia, Brasilia.

Obs.: Folia late ovata, basi cuneata, 11—12 cm longa, 8—9 cm lata.

Eupatorium pycnocephalum Less. in Linnaea 6, 1831, 404; Robinson in Contr. Gray Herb. Harv. Univ. N.S. 55, 1918, 296; 60, 1920, 58 — *Eupatorium praeifolium* Beauverd (non Griseb.) in Herzog, Pfl. boliv. And., 1923, 144.

Hab.: auf Bergwiesen des "Fuerte" bei Samaipata, 1800 m alt., März 1911, Bl. purpurviolett, n. 1769.

Distr.: America borealis et centralis, Venezuela, Colombia, Bolivia, Argentina, Paraguay.

Obs.: Folia parce acuminata, petiolis crassioribus, capitula 6 mm longa, involuero purpureo.

Eupatorium Balansae Hieron. in Engl. Bot. Jahrb. 22, 1897, 778; Hassler in Bull. Herb. Boiss., Sér. 2, 3, 1903, 708.

Hab.: Halbstrauch in den Dünen der "Lomas" am Rio Pirai, 500 m alt., Jan. 1911, n. 1393.

Distr.: Paraguay.

Eupatorium alternifolium Sch.-Bip. var. **genuinum** Hassler f. **nitidum** Koster, nov. forma.

Folia spathulato-oblonga, glaberrima, flavo-viridia, nitida, inferiora $5\frac{1}{2}$ — $7\frac{1}{2}$ cm longa, $1\frac{1}{2}$ — $3\frac{1}{2}$ cm lata.

Hab.: Bergwiesen der Cuesta de los Monos, 1400 m alt., n. 1750.

Sectio **Eximbricata** (DC.) Hoffm. in Engler et Prantl, Nat. Pfl. Fam. 4, 5, 1894, 140.

Eupatorium calderillense Hieron. in Engl., Bot. Jahrb. 40, 1908, 381; Robinson in Contr. Gray Herb. Harv. Univ. N.S. 61, 1920, 69 — *Composita spec. n. 1760* Herzog, Pfl. boliv. And., 1923, 142, 143.

Hab.: zwischen Felsblöcken auf Bergwiesen des Meson bei Samaipata, 2100 m alt., März 1911, Bl. weiss, n. 1760.

Distr.: Bolivia.

Obs.: Capitula circa 30-flora.

Sectio **Praxelis** (Cass.) Benth. ex Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 341.

Eupatorium conoclinanthium Hieron. in Engl., Bot. Jahrb. 40, 1908, 388; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 39.

Hab.: in der Pampa von Santa Cruz, 450 m alt., Jan. 1911, Bl. helllila, n. 1306.

Distr.: Bolivia.

Obs.: Capitula circa 35-flora.

Eupatorium kleiniioides H. B. K., Nov. Gen. et Spec. 4, 1820, 120; Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 342; Britton in Torrey Bot. Club 18, 1891, 334; Hieronymus in Engl., Bot. Jahrb. 22, 1897, 782; Pilger in Engl., Bot. Jahrb. 30, 1901, 202; Usteri, Fl. São Paulo, 1911, 252; Robinson in Contr. Gray Herb. Harv. Univ. N.S., 55, 1918, 319; 60, 1919, 84; 61, 1920, 72; Knuth in Fedde, Repert. Beih. 43, 1928, 700; Malme in Ark.f. Bot. 24 A, 1932, 30.

Hab.: an felsigen Stellen der Bergwiesen an der Cuesta de los Monos, 1400 m alt., März 1911, Bl. purpurviolett, n. 1751.

Distr.: Venezuela, Colombia, Peruvia, Bolivia, Brasilia, Argentina, Paraguay.

Sectio **Conoclinium** (DC.) Benth. ex Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 360.

Eupatorium Candolleianum Hook. et Arn. in Hooker, Comp. Bot. Mag. 1, 1835, 243; Baker in Mart. Fl. Bras. 6, 2, 1873—1876, 363; Grisebach in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 171; Hieronymus, Pl. diaphor. fl. Argent. 1882, 144; Hieronymus in Engl., Bot. Jahrb. 22, 1897, 789; Arechavaleta, Fl. Urug. 3, 1906, 169; Hassler in Trab. Mus. Farm. Med. de Buenos Aires 21, 1909, 124; Hicken, Chlor. Plat. Argent., 1910, 239; Hassler in Fedde, Repert. 14, 1916, 290; Herter, Estud. Bot. Urug. 4, 1930, 119; Malme in Kungl. Sv. Vet. Akad. Handl., ser. 3, 12, 1933, 51; Bornmueller in Rev. Sudamer. Bot. 2, 1935, 39, 40 — *Eupatorium spec. n. 1364* Herzog, Pfl. boliv. And., 1923, 124.

Hab.: auf einer Sumpfwiese westlich von Rio Pirai, 500 m alt., Jan. 1911, Bl. rosenrot, n. 1364.

Distr.: Brasilia, Argentina, Paraguay, Uruguay.

Sectio **Campuloclinium** (DC.) Benth. ex Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 354.

Eupatorium macrocephalum Less. in Linnaea 5, 1830, 136; Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 358; Hieronymus in Engl., Bot. Jahrb. 22, 1897, 788; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 148; Pilger in Engl., Bot. Jahrb. 30, 1901, 202; Chodat in Bull. Herb. Boiss., Sér. 2, 2, 1902, 312; Arechavaleta, Fl. Urug. 3, 1906, 165; R. E. Fries in Ark. f. Bot. 5, 1906, 10; Hassler in Trab. Mus. Farmac. Med. de Buenos Aires 21, 1909, 123; Hicken, Chlor. Plat. Argent. 1910, 241; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 38, 57; Robinson in Contr. Gray Herb. Harv. Univ. N.S. 55, 1918, 326; 61, 1920, 73; Robinson in Herzog, Pfl. boliv. And., 1923, 115; Herter, Estud. Urug. 4, 1930, 120; Malme in Ark. f. Bot. 24 A, 1932, 32; Malme in Kungl. Sv. Vet. Akad. Handl., ser. 3, 12, 1933, 50; Bornmueller in Rev. Sudamer. Bot. 2, 1935, 39; Malme in Sv. Bot. Tidskr. 30, 1936, 27 — *Eupatorium spec. n. 1500* Herzog, Pfl. boliv. And., 1923, 125.

Hab.: Pampa von Santa Cruz an sandigen Hügeln, 450 m alt., Jan. 1911, *n. 1500*.

Distr.: Mexico, Colombia, Brasilia, Argentina, Paraguay, Uruguay.

Mikania Willd.

Mikania psilostachya DC., Prodr. 5, 1836, 190; Baker in Mart., Fl. Bras. 6, 2, 1873—1876, 265; Britton in Bull. Torrey Bot. Club 19, 1892, 1; Hieronymus in Engl., Bot. Jahrb. 19, 1894, 48; Buchtien, Contr. Fl. Boliv. 1, 1910, 190; Robinson in Contr. Gray Herb. Harv. Univ. N.S., 64, 1922, 97; Malme in Ark. f. Bot. 24 A, 1932, 34 — *Willoughbya psilostachya* (DC.) Kuntze, Rev. Gen. Pl. 1, 1891, 272; Rusby in Mem. Torrey Bot. Club 6, 1896, 58; Rusby in N.Y. Bot. Gard. 4, 1907, 381.

Hab.: windend im Gebüsch der "Lomas" am Rio Pirai, 500 m alt., Jan. 1911, *n. 1394*.

Distr.: Colombia, Peruvia, Bolivia, Brasilia.

Mikania phyllopoda Griseb. in Abh. Kön. Ges. Wiss. Gött. 19, 1874, 122; 24, 1879, 173; Hieronymus in Engl., Bot. Jahrb. 22, 1897, 795; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 184; R. E. Fries in Ark. f. Bot. 5, 1906, 11.

Hab.: schlingend in Hecken bei Comarapa, 1900 m alt., April 1911, Bl. weiss, *n. 1927*.

Distr.: Bolivia, Argentina.

INULEAE.

G. Beauverd determinavit Inuleas huius syllogae, anno 1915; dicit eas in litteris "horriblement difficiles". Determinationes eius non omnes congruunt cum meis.

Pluchinae.

Pterocaulon Ell.

Pterocaulon Lorentzii Malme in Bih. Kungl. Sv. Vet. Akad. Handl. 27, 1901, 22; Chodat et Hassler in Bull. Herb. Boiss., Sér. 2, 3, 1903, 717; Herter, Estud. Bot. Urug. 4, 1930, 125; Malme in Ark. f. Bot. 24 A, 1932, 60; Bornmueller in Rev. Sudamer. Bot. 2, 1935, 43; Malme in Sv. Bot. Tidskr. 30, 1936, 28 — *Pterocaulon Malmeanum* Chod. in Bull. Herb. Boiss., Sér. 2, 2, 1902, 388; Beauverd in Herzog, Pfl. boliv. And. 1923, 115, 121, 123, 124, 125.

Hab.: in den Hügelfeldern von Florida und Palissa, 900 m alt., Dez. 1910, "Freza dilla negra", n. 1292.

Distr.: Brasilia (Rio grande do Sul), Paraguay, Uruguay, Argentina.

Pterocaulon alopecuroides (Lam.) DC., Prodr. 5, 1836, 454; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 168; Malme in Bih. Kungl. Sv. Vet. Akad. Handl. 27, 1901, 17; Chodat in Bull. Herb. Boiss., Sér. 2, 2, 1902, 387; Chodat et Hassler, eod., 3, 1903, 717; Fries in Ark. f. Bot. 5, 1906, 15; Hassler in Trab. Mus. Farmac. Med. de Buenos Aires 21, 1909, 128; Knuth in Fedde, Repert. 43 Beih., 1928, 708; Malme in Kungl. Sv. Vet. Akad. Handl. 12, 1933, 83 — *Conyza alopecuroides* Lam., Enc. Méth. Bot. 2, 1786, 93 — *Pterocaulon spicatum* DC., Prodr. 5, 1836, 454; Grisebach in Abh. Kön. Ges. Wiss. Gött. 19, 1874, 132.

Hab.: in den Campos zwischen Rio Pirai und Rio Cuchi, 550 m alt., n. 1292/a.

Distr.: India occidentalis, Guyana, Venezuela, Brasilia, Peruvia, Bolivia, Paraguay, Argentina.

Gnaphalinae.

Facelis Cass.

Facelis prob. **Schultziana** Beauverd in Bull. Soc. Bot. de Genève, Sér. 2, 5, 1913, 219 — *Facelis capillaris* Rusby, det. Beauverd in Herzog, Pfl. boliv. And., 1923, 165.

Hab.: auf trockenen Triften am Fuss des Cerro Sipascoya, 2900 m alt., April 1911, n. 2048.

Distr.: Bolivia.

Obs.: Specimina Herzogii, 5—11 cm longa; a diagnosi Beauverdi differunt longitudine. Nonnulla specimina Herzogii copiose ramosa sunt. Flores capituli, 5—10, radii feminei 2—7, disci bisexuales 2—4; corolla circa 2 mm longa. Differunt a *F. capillaride* Rusby foliis alternis.

Achyrocline (Less.) DC.

Achyrocline satureioides (Lam.) DC., Prodr. 6, 1837, 220; Weddell, Chlor. And. 1, 1855, 148; Grisebach in Abh. Kön. Ges. Wiss. Gött. 19, 1874, 133; 24, 1879, 187; Baker in Mart., Fl. Bras. 6, 3, 1882—1884, 115; Britton in Torrey Bot. Club 19, 1892, 148; Rusby in Mem. Torrey Bot. Club 3, 1893, 56; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 153; Chodat in Bull. Herb. Boiss., Sér. 2, 1, 1901, 415; 2, 1902, 389; Pilger in Engl., Bot. Jahrb. 30, 1901, 203; Arechavaleta, Fl. Urug. 3, 1906, 284, t. 54; Hassler in Trab. Mus. Farmac. Med. de Buenos Aires 21, 1909, 128; Hicken, Chlor. Plat. argent., 1910, 249; Usteri, Fl. São Paulo, 1911, 254; Hauman-Merck in Ann. Mus. Nac. Hist. Nat. de Buenos Aires 24, 1913, 431; Beauverd in Herzog, Pfl. boliv. And., 1923, 115, 123, 124; Knuth in Fedde, Repert. 43, 1928, Beih., 709; Herter, Estud. Bot. Urug. 4, 1930, 124; Malme in Ark. f. Bot. 24 A, 1932, 62; Malme in Kungl. Sv. Vet. Akad. Handl. 12, 1933, 84 — *Gnaphalium satureioides* Lam. Diet. Enc. Méth. Bot. 2, 1786, 747.

Hab.: in der Pampa von Santa Cruz, 450 m alt., Jan. 1911, n. 1303.

Distr.: Peruvia, Bolivia, Venezuela, Brasilia, Argentina, Uruguay.

Obs.: Valde variabilis. Specimen Herzogii congruit cum specimine

boliviano Bang n. 239, internodiis $\frac{1}{2}$ —2 (—3 in Bang n. 239) cm longis, foliis linearibus, approximatis, $3\frac{1}{2}$ —4 cm longis, 2—4 cm latis. In specimenibus compluribus Herbarii lugdunensis internodia 1—5 cm longa, folia latiora, potius lanceolata, distantia, 6—8 cm longa, 5—9 mm lata. Attamen in diagnosi Lamarekii folia linearia esse dicuntur.

Achyrocline prob. **rufescens** (H. B. K.) DC., Prodr. 6, 1837, 220; Hieronymus in Engl., Bot. Jahrb. 29, 1900, 29; 28, 1901, 594; Rusby in Bull. N. Y. Bot. Gard. 4, 1907, 387 — *Gnaphalium rufescens* H. B. K., Nov. Gen. 4, 1820, 78 — *Achyrocline alata* DC. var. *rufescens* (DC.) Baker in Mart., Fl. Bras. 6, 3, 1882—1884, 117 — *Achyrocline bogotensis* Beauverd (non (H. B. K.) DC.) in Herzog, Pfl. boliv. And., 1923, 179.

Hab.: an schattigen begrasten Felsen auf dem Plateau bei Palca, 3600 m alt., Mai 1911, n. 2123.

Distr.: Ecuador, Bolivia.

Obs.: Certo determinari non potest, cum specimina, quae comparem mihi desint et diagnoses specierum affinium brevissimae sint. Differt specimen Herzogii capitulis 5 mm longis, quae in diagnosi huius speciei 3 mm longa sunt. Differt autem ab *A. bogotensi* (H. B. K.) DC. foliis utrinque albide lanatis, $2\frac{1}{2}$ —4 cm longis, 2—4 mm latis, capitulis 5 mm longis, cum in diagnosi huius speciei folia supra glabriuscula, 5 cm longa, 2 mm lata, capitula 3 mm longa sunt. Differt etiam ab *A. satureioidi* (Lam.) DC. foliis decurrentibus, floribus brevioribus et crassioribus; in capitulis specimenis Herzogii squamae involucri in sicco pallide stramineo-rufescentes, flores radii feminei 2 vel 1, disci bisexuales 3—5 numero sunt.

Achyrocline prob. **ramosissima** (Sch.-Bip.) Britton in Torrey Bot. Club 19, 1892, 148; Rusby in Mem. Torrey Bot. Club 3, 1893, 57; Perkins in Engl., Bot. Jahrb. 49, 1913, 225; Beauverd in Herzog, Pfl. boliv. And., 1923, 159, 216 — an *Achyrocline satureioides* DC. var. *densa* Weddell, Chlor. And., 1, 1855, 148 ?

Hab.: auf steinigem Bergtrifften des Comarapathales, 2300 m alt., April 1911, n. 1899.

Distr.: Bolivia.

Obs.: Specimina, quae compararentur, non vidi.

Lucilia Cass.

Lucilia conoidea Weddell, Chlor. And. 1, 1855, 154 Pl. 26, C; Weberbauer, Pfl. peruan. And., 1911, 254; Beauverd, Pfl. boliv. And. 1923, 210.

Hab.: ausgedehnte Rasenpolster an sandigen Bachufer im Thälchen Haiparu, 4500 m alt., Okt. 1911, n. 2358.

Distr.: Peruvia (Andes).

Lucilia Schultzii (Weddell) Gray in Proc. Amer. Acad. 5, 1862, 138 — *Merope Schultzii* Weddell, Chlor. And. 1, 1855, 163; Buchtien, Contr. Fl. de Boliv. 1, 1910, 192 — *Lucilia erythractis* Beauverd (non (Weddell) Sch.-Bip.) in Herzog, Pfl. boliv. And., 1923, 179.

Hab.: auf kurzrasigen mageren Trifften des Cerro de Palca, 4600 m alt., Mai 1911, n. 2089/b.

Distr.: Peruvia, Bolivia.

Obs.: Satis congruit cum diagnosi Weddellii, sed specimina, quae comparem, non vidi. Folia circa 2 mm lata; flores radii feminei 5—11,

disci bisexuales 2—3. Differt a *L. erythraciti* (Weddell) Sch.-Bip., cum folia huius speciei petiolata sunt, cum petiolo 8—10 mm longa, achenium glabrum est, sed folia speciminum Herzogii sessilia, vaginantia, cum vagina circa 7 mm longa, achenium parce papillosum est.

Lucilia Jamesonii Baker in Mart., Fl. Bras. 6, 3, 1882—1884, 114; Fries in Ark. f. Bot. 5, 1906, 16; Herzog, Pfl. boliv. And., 1923, 152 — *Gnaphalium Jamesonii* O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 152.

Hab.: auf dem Gipfel des Berges über Vallegrande, zwischen Steinen, 2550 m alt., März 1911, n. 1898.

Distr.: Bolivia, Argentina.

Gnaphalium L.

Specimina huius generis, vix determinari possunt, cum species valde variabiles sunt et specimina, quae comparem, mihi propter difficultatem huius temporis desint.

Gnaphalium cheiranthifolium Lam. var. **multiflorum** Koster, nov. var. — *Gnaphalium cheiranthifolium* Lam., det. Beauverd in Herzog, Pfl. boliv. And., 1923, 142, 216.

Flores disci bisexuales 15—25.

Hab.: auf kahlen steinigen Kämmen um Samaipata, 2000—2200 m alt., März 1911, n. 1758.

Obs.: Species, ut nunc accipitur valde variabilis videtur, simplex aut ramosissima, magnitudine variante, foliis breviter vel longe decurrentibus, colore et forma squamarum involucri et numero florum bisexualium variantibus. Propius examinanda est.

Gnaphalium prob. **melanosphaeroides** Sch.-Bip. ex Weddell, Chlor. And. 1, 1855, 148; Grisebach in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 187 — *Gnaphalium Dombeyanum* Beauverd (non DC.) in Herzog, Pfl. boliv. And., 1923, 182.

Hab.: an Felsen im obersten Llavethal, 4100 m alt., Mai 1911, n. 2111.

Distr.: Peruvia, Bolivia, Argentina.

Obs.: Folia inferiora ad $7\frac{1}{2}$ cm longa, circa 7 mm lata, caulina ut in diagnosi Weddellii, flores disci bisexuales 6—8. Differt a *G. Dombeyano* DC., cuius folia iuniora supra subaraneosa, subtus villosa-hirsuta, involucri squamae albido-subrufescentes, lanceolatae, acutiusculae; in speciminibus Herzogii folia utrinque lanato-tomentosa, involucri squamae fuscae, exteriores late ellipticae, interiores lanceolatae, omnes apice obtusissimae vel rotundatae sunt.

Specimen Herzogii alterum:

Hab.: Palca, Mai 1911, s. n.,

varietas maior, speciei antecedentis videtur, differt autem statura simplici, foliis caulinis breviter decurrentibus, maioribus, ad 9 cm longis, ad 9 mm latis, floribus disci bisexualibus 12—15.

Gnaphalium prob. **Jelskii** Hieron. in Engl., Bot. Jahrb. 36, 1905, 483 — prob. *Gnaphalium Dombeyanum* var. *Mandoni* Beauverd in Herzog, Pfl. boliv. And., 1923, 164.

Hab.: auf subalpinen Wiesen des Sunchalkammes, 2900 m alt., April 1911, n. 2005/a.

Distr.: Peruvia (Andes).

Obs.: Differt foliorum nervis lateralibus, qui perspicui non possunt, foliis potius chartaceis. Inflorescentia juvenilis terminalis glomerata, flores disci bisexuales 8—10. Buchtien s.n., Unduavi, Nord-yungas (in schedula *Gnaphalium Mandoni* Sch.-Bip., sed nomen nudum) eadem species videtur, sed inflorescentia modo ut in specimine Herzogii modo descripsi, modo in diagnosi Hieronymi corymbosa; flores disci bisexuales circa 14 numero sunt.

Gnaphalium prob. **lacteam** Meyen et Walpers in Nov. Act. Acad. Caes. Carol. 19, suppl. 1, 1843, 276; Weddell, Chlor. And. 1, 1855, 146 Pl. 24, B; Klatt in Linnaea 42, 1878—1879, 142, 144; Reiche, Fl. de Chile 4, 1905, 62 — var. *caespitosum* Beauverd in Herzog, Pfl. boliv. And., 1923, 210.

Hab.: auf Felsschutt im Granitgebiet des Cerro Imaculado, 4600 m alt., Okt. 1911, n. 2344/a.

Distr.: Peruvia, Bolivia, Chili borealis.

Obs.: Differt squamis involucri pallide stramineis, non argenteo-albis.

HELENIEAE.

Tagetes L.

Cum nunc diagnoses nonnullarum specierum ex Uruguay et Argentina consulere non possim, tres species, quae novae videntur, publici iuris facere non possum; qua de causa diagnoses tantum addo.

Tagetes prob. **gracilis** DC., Prodr. 5, 1836, 645; Reiche, Fl. de Chile 4, 1905, 127.

Hab.: in der Dornbuschsteppe bei Comarapa, 1900 m alt., April 1911, n. 1848/a.

Distr.: Peruvia ?, Chili.

Obs.: Folia 5—11-juga, ad 6 cm longa; segmentibus ad $1\frac{1}{2}$ cm longis. Capitula 14—18 (in diagnosi 10—12)-flora; flores radii ligulati 5. Pappus biserialis, paleis seriei externae 5 brevissimis, obtusis, apice laciniatis, internae 2 (longitudine differentibus) vel 1, lanceolatis, apice subulatis, corollae aequilongis, cum 1 vel 2 brevioribus, truncatis, apice laciniatis. Specimina, quae compararentur, non vidi.

Tagetes prob. **maxima** O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 181.

Hab.: am Ufer des Rio Grande de Chulumani, 2000 m alt., Mai 1911, n. 2161.

Distr.: Bolivia.

Obs.: Folia superiora alterna, inferiora opposita. Flores radii 4—5. Pappi paleae minores 5-plo uno longo breviores.

Tagetes prob. nov. spec.

Herbacea, plus quam 35 cm alta, simplex, glaberrima, tenuis. Caulis subteres, parce sulcatus, circa $1\frac{1}{2}$ mm crassus. Folia opposita, pinnata, 3- vel 4-juga cum impari, parte basali segmentis utrinque minutis, circa 5, linearibus, subfimbriatis praedita, folia 4— $6\frac{1}{2}$ cm longa, 2—3 cm lata, superiora minor; segmentis lanceolato-ellipticis, serratis, subtus glandulosis, pinninervibus, nervo mediano prominente subtus, chartaceis, obscure viridibus (in sicco), 1—3 cm longis, 4—6 mm latis. Inflorescentia terminalis, compacte corymbosa, parva, 2—3 cm lata et longa. Capitula breviter pedunculata, pedunculo 3—5 mm longo, cylindrica, circa 13 cm longa, circa 3 mm lata, circa 11-flora; involucrium cylindricum, 5-sulcatum, squamis connatis, parte superiore subdeltoidea subobtusata excepta, striato-glandulosum, 11 mm

longum. Flores radii feminei 5, corollae parte ligulata, subdeltoidea, apice trilobata, lobis obtusissimis, 4 mm longa, parte tubulosa tenuissima, 5 mm longa; styli rami apice obtusi; antherae desunt. Flores disci bisexuales tubulosi, corolla infundibuliformis, ad basin pubescens, apice 5-lobata, lobis acutis, 7 mm longa; styli rami breves, apice subdeltoidei, hirtelli; antherae basi truncatae, apice appendiculatae, appendice acuta. Achenium omnium florum oblongum, costatum, glabrum, 6 mm longum, 1 mm crassum; pappus paleaceus, palea 1 (interdum 2) 2 mm longa, ceterae 3—4 brevissimae. Receptaculum parvum, alveolatum.

Hab.: im subalpinen Gebüsch der Abra de Catalina bei Comarapa, 2500 m alt., April 1911, Bl. goldgelb, n. 1975.

Obs.: Species praecedens affinis, sed differt statura, foliis, inflorescentia, corolla florum radii.

Tagetes prob. nov. spec.

Herbacea, annua, glaberrima, 25—40 cm alta, 9—15 cm lata, parte superiore maiore foliosa, regulariter ramosa, inferiore nuda, quod folia deciderant; caulis teres, sulcatus, 1—3 mm crassus; ramis patulis, saepe oppositis, 6—12 cm longis; internodiis 1—4 cm longis. Folia saepe opposita, pinnata, 5—7-juga cum impari, 2—6 cm longa; segmentis oppositis vel suboppositis, linearibus vel oblanceolato-linearibus, integris vel serratis (dentibus inferioribus saepe filiformibus) flavo-viridibus (in sicco), subtus glandulosis (glandulis rotundis fulvidis), 1—5 mm distantibus, 2—20 mm longis, $\frac{1}{2}$ —1 mm latis, inferioribus saepe solitarii, filiformibus; axillo folii parce alato. Capitula numerosa, apice ramulorum superiorum, 1 vel 2, pedunculata, pedunculo ad basin bractea lineari fimbriata praedito, $\frac{1}{2}$ —1 cm longo, cylindrica, circa 9-flora, circa 1 cm longa, 2—3 mm crassa; involucrem cylindricum, subangulare, glandulosum, glandulis elongatis fulvidis, 1 cm longum, squamis 5, connatis, parte superiore deltoidea excepta. Flores radii feminei 2—3, ligulati, parte corollae tubulosa 4 mm longa, parte ligulata patente, lutea, apice undulata, 2 mm longa, 3 mm lata; styli rami modice longi, subacuti; antherae desunt. Flores disci bisexuales, tubulosi; corolla infundibuliformis, lobis 5, subacutis, 4 mm longa; styli rami breves, apice deltoidea, hirtelli; antherae basi truncatae, apice appendiculatae, appendice acuta. Achenium lineari-oblongum, nigrum, angulare, subglabrum vel aureo-sericeum, 6 mm longum, $\frac{3}{4}$ mm crassum; pappus paleaceus, biseriatus, paleis seriei externae brevissimis 5, oblongis, apice obtusis, laciniatis, internae 3 (in floribus radii) vel 5 (in floribus disci), lanceolatis, longitudine differentibus, rigidis, sericeis, apice subulatis, ad 5 mm longis, sed interdum brevioribus, apice truncatis laciniatis. Receptaculum parvum, alveolatum.

Hab.: in der Dornbuschsteppe bei Comarapa, 1900 m alt., April 1911, n. 1848/b.

Obs.: A *T. terniflora* H. B. K. differt inflorescentia et pappo.

Tagetes prob. nov. spec.

Herbacea, annua, saepe valde ramosa, 5—35 cm alta; ramis apicem versus saepe decrescentibus, oppositis, $2\frac{1}{2}$ —9 cm longis. Caulis angularis, glaber, 1— $1\frac{1}{2}$ mm crassus; internodiis 1— $2\frac{1}{2}$ cm longis. Folia opposita, pinnata, 5—8-juga cum impari, 1— $1\frac{1}{2}$ cm longa; segmentis linearibus, integris, in marginibus et in nervo mediano subtus minutissime hispidis, apice acutissimis, flavo-viridibus (in sicco), 1—7 mm longis, $\frac{1}{2}$ mm latis vel an-

gustioribus, inferioribus minutis. Capitula apice caulis et ramorum et in axillis foliorum superiorum, breviter pedunculata, pedunculo 1—5 mm longo, cylindrica, circa 10-flora, 8—10 mm longa, 2—3 mm crassa; involucrium cylindricum, 7 mm longum, squamis vix connatis, oblongis, apice truncatis, minute ciliatis, nervo mediano in mucronem tenuem terminante, glabris, serie glandularum utrinque juxta nervum medianum praeditis. Flores radii feminei 2, ligulati; corolla $4\frac{1}{2}$ mm longa, parte ligulata subquadrata, patente, alba, 1 mm longa et lata; styli rami breves; antherae desunt. Flores disci bisexuales, tubulosi, 5-lobata, lobis apice acutis, 3 mm longi; styli rami breves; antherae basi obtusae, apice appendiculatae, appendice acuta. Achenium omnium florum lineari-oblongum, nigrum, angulare, ad basin parce pubescens; pappus paleaceus, paleis circa 7, longitudine et latitudine differentibus, apice terminantibus in setam rigidam (interdum 2). Receptaculum parvum, alveolatum.

Hab.: auf Bergtriften um Samaipata, 1900 m alt., März 1911, "anisillo", n. 1677.

Obs.: *T. foeniculaceo* Poepp. affinis videtur, sed pappus eius speciei non describitur in diagnosi; praeterea parce ramosa est.

Porophyllum Vaill.

Porophyllum ruderales (Jacq.) Cass. var. **angustifolia** Hassler in Trab. Mus. Farm. Med. de Buenos Aires 21 (1909) 131.

Hab.: an sandigen Hügeln zwischen Rio Pirai und Rio Cuchi, 500 m alt., Jan. 1911, Bl. braunlich, n. 1441.

Distr.: Paraguay, Argentina.

Porophyllum platyphyllum Chodat in Bull. Herb. Boiss., Sér. 2, 2, 1902, 397; Chodat et Hassler, eod. 3, 1903, 730.

Hab.: auf Bergwiesen der Cuesta de los Monos, 1300 m alt., März 1911, Peterselienduftend, n. 1733.

Distr.: Paraguay.

Obs.: Forma gracilior, floribus nigro-purpureiscentibus, pappo sordide albo.

Pectis L.

Seetio **Eupectis** Gray in Proceed. Amer. Acad. of Arts and Sci. 19, 1883, 44.

Pectis Swartziana Less. in Linnaea 6, 1831, 711; DC., Prodr. 5, 1836, 99; Fernald in Contr. Gray Herb. N. S. 12, 1897, 69; Urban, Symb. Antill. 5, 1907, 269; Rydberg in N. Amer. Fl. 34, 3, 1916, 201; Knuth in Fedde, Repert. Spec. Nov. 43, Beih., 1928, 727; Standley in Contr. U. S. Nat. Herb. 27, 1928, 384; Moore in Fawcett and Rendle, Fl. Jamaica 7, 1936, 263.

Hab.: in der Pampa von Santa Cruz, 450 m alt., Jan. 1911, n. 1332; in den Lomas am Rio Pirai, 500 m alt., Dez. 1911, s. n.

Distr.: Mexico, Guatemala, Panama, India occidentalis, Venezuela, Columbia, Bolivia.

Seetio **Pectothrix** Gray in Proceed. Amer. Acad. of Arts and Sci. 19, 1883, 47.

Pectis sessiliflora (Less.) Sch.-Bip. in Seemann, Bot. Voy. Herald, 1852—1857, 309; Grisebach in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 201;

Rusby in Mem. Torrey Bot. Club 3, 3, 1893, 62; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 166; R. E. Fries in Arkiv f. Bot. 5, 1906, 24; (etiam det. G. Beauverd) — *Lorentea sessiliflora* Less. in Linnaea 6, 1831, 720; DC., Prodr. 5, 1836, 102; Fernald in Contr. Gray Herb. N. S. 12, 1897, 61.

Hab.: in der Dornbuschsteppe beim "Palo", 1450 m alt., April 1911, n. 1809.

Distr.: Bolivia.

Obs.: Differt a diagnosi Lessingii foliis internodiis longioribus, ut in specimina Bangii et Fiebrigii in Herbario Lugdunensi.

ANTHEMIDEAE.

Plagiocheilus Arn.

Plagiocheilus ciliaris Weddell, Chlor. And. 1, 1855, 227.

Hab.: im Moos und Gras an Bachufern im Thal des Rio Saujana, 3400 m alt., Okt. 1911, n. 2379.

Distr.: Bolivia.

CICHORIEAE.

Leontodontinae.

Hypochoeris L.

Sectio *Achyrophorus* (Scop.) Hoffm. in Engler et Prantl, Nat. Pfl. Fam. 4, 5, 1894, 362.

Hypochoeris elata (Wedd.) Hoffm. l.c.; Beauverd in Herzog, Pfl. boliv. And., 1923, 152 (cum var. *angustifolia*) — *Achyrophorus elatus* Weddell, Chlor. And. 1, 1855, 223.

Hab.: auf Wiesen des Gipfels über Vallegrande, 2550 m alt., März 1911, n. 1841.

Distr.: Bolivia.

Obs.: Non possum iudicare, quo iure Beauverd recte dicat specimina Herzogii varietatem novam huius speciei esse, cum specimina, quae compararentur, mihi desint.

Hypochoeris stenocephala (A. Gray) O. K. var. **integrifolia** O. Kuntze, Rev. Gen. Pl. 3, 2, 1893, 160; Beauverd in Herzog, Pfl. boliv. And., 1923, 179, 214 — *Achyrophorus taraxacoides* Walp. var. *stenocephalus* (A. Gray) Weddell, Chlor. And. 1, 1855, 221 Pl. 41 A.

Hab.: auf feuchten Wiesen der alpine Region des Tunari-gebietes, 4100 m alt., Mai 1911, Bl. weiss, n. 2088.

Distr.: Peruvia, Bolivia.

Obs.: Capitula interdum breviter pedunculata, pedunculo 1—8 mm longo.

Hypochoeris prob. **eriolaena** (Sch.-Bip.) Reiche, Fl. de Chile 5, 1910, 15 — *Achyrophorus eriolaenus* Sch.-Bip. in Bonplandia, 1855, 236; 1856, 54; Weddell, Chlor. And. 1, 1855, 220 — *Hypochoeris eriolaena* var. *hispida* Beauverd in Herzog, Pfl. boliv. And., 1923, 210.

Hab.: auf Detritus in Granitfesspalten am Südgrad des Serro immacolado, 2500 m, Oct. 1911, n. 2343 bis.

Distr.: Peru, Chili septentrionalis (Andes).

Obs.: Folia speciminorum Herzogii, iunioribus exceptis, usque ad basin defracta vel comesa vel aliter corrupta; iuniora praecipue margine et

nervo medio pilis longis subrigidis, crispis, grossis praedita. Capitula campanulato-cylindrica.

Fortasse Beauverd recte dicit eam varietatem novam esse, sed specimen integrum non est et alia, quae comparentur, praesta non sunt.

Hypochoeris ornata Koster, nov. spec. — *Hypochoeris taraxacoides* var. *lanuginosa* Beauverd in Herzog, Pfl. boliv. And., 1923, 228 (nomen nudum) (fig. 3, a—b).

Herbacea, parva, acaulis, perennis, $2\frac{1}{2}$ cm longa, 6 cm lata; radice crassa. Folia omnia radicalia, rosulata, sessilia, anguste oblonga, runcinato-pinnatifida, dentibus integris vel undulatis, saepe curvatis, subacutis, crassa, apice subacuta, parte basali pedunculiformi, margine basi lanata, pilis longis, cetera glabra, $2\frac{1}{2}$ —3 cm longa, 5—7 mm lata. Capitulum solitarium, sessile, multiflorum, 2 cm longum, circa 13 mm crassum; involucri campanulato-cylindrico, squamis 3-seriatis, subaequilongis, lanceolatis, apice nigro-viridibus, acutis, $1\frac{1}{2}$ cm longis, $1\frac{1}{2}$ —2 mm latis, externis parte superiore pilis applanatis, crispis, circa $1\frac{1}{2}$ mm longis, interdum fissis praeditis. Flores bisexuales, corolla ligulata, apice 5-dentata, 14 mm longa, ligula 2 mm lata. Antherae apice obtusae, ad basin breviter sagittatae, partibus 2 obtusis. Styli rami breves, apice obtusi. Achenium immaturum, breve, cylindricum, erostratum, costatum, subangulatum; pappus uni-seriatus, setis plumosis, albis, 6 mm longis. Receptaculi squamae lanceolatae, apice subulatae.



Bevelander del.

Fig. 3 — *Hypochoeris ornata* Koster, nov. spec. a: planta florescens ($\times 1$); b: squama involucri externa ($\times 3$) — *Hypochoeris parvifolia* Koster, nov. spec. c: planta florescens ($\times 1\frac{1}{4}$).

Hab.: am Cerro de Oruro auf steinigem trockenem Boden, 3800 m alt., Nov. 1911, n. 2522 c.

Obs.: *H. barbata* (Sch.-Bip.) Reiche differt folii margine ciliata et capitulo longiuscule pedunculato. *H. ornata* differt a ceteris speciebus affinis et fortasse etiam a *H. barbata* (quam non vidi) pilis applanatis crispis involucri squamarum externorum, quae causa nominis est.

Hypochoeris parvifolia Koster, nov. spec. — *Hypochoeris Hohenackeri* Beauverd in Herzog, Pfl. boliv. And., 1923, 211 (fig. 3, c).

Herbacea, nana, geminata, acaulis, perennis, 2 cm alta, 3 cm lata, rhizomate crasso, furcato, $\frac{1}{2}$ cm lato. Folia numerosa, crebre rosulata, sessilia, anguste oblonga, apice obtusa, parva, crassa, integra, utrinque glabra, subcanaliformia, nervo medio basi dilatato, 1—1½ cm longa, circa 3 mm lata. Capitulum solitarium, sessile, multiflorum, campanulato-oblongum, 2 cm longum, 13 mm crassum; involuero campanulato, squamis decrescentibus, 6-seriatis, apice obtusis, sparse crispe albo-pubescentibus, margine partis superioris ciliatis, externis ovatis, nigro-viridibus, 5 mm longis, interioribus ovato-oblongis, intimis lanceolatis, parte superiore nigro-viridibus. Flores bisexuales; corolla ligulata, apice 5-dentata, dentibus obtusis, parte inferiore pilos paucos ferente, 18 mm longa, ligula 2 mm lata, intrinsecus probabiliter lutea, extrinsecus subnigra (in sicco). Antherae apice obtusae, basi sagittatae, partibus 2 obtusis. Styli rami modice breves apice subobtusiusculi. Achonium immaturum breve, oblongum, costatum, subangulatum, erostratum; pappus uni-seriatus, setis plumosis, albis, 1 cm longis. Receptaculi squamae lineari-lanceolatae.

Hab.: Rosettenpolster auf Alpenwiesen im Teacota-Thal, 4300 m alt., Okt. 1911, n. 2425 c.

Obs.: Fieri potest, ut Beauverd recte tribuat hoc specimen *H. Hohenackeri* (Sch.-Bip.), sed diagnosis eius speciei tam manca est, ut non possim decernere, utrum specimen Herzogii pertineat ad *H. Hohenackeri* an non. *H. parvifolia* *H. stenocephalae* affinis est, quae differt rhizomate, foliis, squamis involucri.

Crepidinae.

Hieracium L.

Species huius generis determinavit J. L. van Soest, 's Gravenhage.

Sectio Piloselliformia Fr., Epicr. gener. Hierac., 1862, 142.

Hieracium lagopus Don in Trans. Linn. Soc. 16, 2, 1830, 176; Zahn in Engler, Pflanzenr. 4, 280, 1922, 1095 — *Hieracium fulvipes* Weddell, Chlor. And. 1, 1855, 224; Beauverd in Herzog, Pfl. boliv. And., 1923, 138.

Hab.: an steinigen Abhängen der Buschregion von Tres Cruces, 1500 m alt., Febr. 1911, n. 1591.

Distr.: Columbia, Bolivia.

Obs.: Forma squamis involucri minus floccosis.

Sectio Aurelliformia Fr., Epicr. gener. Hierac., 1862, 145.

Hieracium spec. — *Hieracium Herzogianum* Beauverd in Herzog, Pfl. boliv. And. 1923, 165 (nomen nudum).

Hab.: an Felsen des Cerro Sipasecoya, 3300 m alt., April 1911, n. 2046 c.

Obs.: Specimen corruptum. Ab *H. argentinensi* Zahn differt pilis insigne dentatis, foliis caulinis circa 8, pedicellis longioribus, squamis involucri villosis, eglandulosis, sine marginibus.

MUTISIEAE.

Mutisieae huius syllogae, excutiendae traditae erant G. Beauverdio, annis 1914—1930. Is magnum numerum novarum specierum et varietatum

invenire sibi visus est neque tamen diagnosin eis adiunxit. In Th. Herzogii "Die Pflanzenwelt der bolivischen Anden und ihres östlichen Vorlandes, Die Vegetation der Erde 15, 1923", nonnulla ex his nominibus nudis publici iuris facta sunt. Cum aliquot ex his novis speciebus re vera non novas novasque varietates interdum novas species esse appareret et omnino inter determinationes Beauverdii et eius, quae haec scripsit, compluribus locis nonnihil interesset, totam illam materiem denuo tractare necessarium esse videbatur. Fieri tamen potest, ut propter difficultatem huius temporis, cum saepe neque libros, quibus opus erat, inspicere neque alia specimina cum nostris comparare nobis liceret, inter species novas dictas una vel altera occurrat, quae iniuria hoc titulo praedita sit. Inter libros, quibus aegre carebamus, recentissimi ab Americanis conscripti sunt, e.g. a A. L. Cabrera, qui anno 1934 se monographiam generis *Mutisiae* compositurum esse pollicitus est, et a R. Bacigalupi, qui anno 1931 huic rei operam dabat, ut investigationem specierum Americae australis generis *Pereziae* institueret.

Gochnatinae.

Chuquiraga Juss.

Chuquiraga Jussieui Gmelin var. *lancifolia* (Humb. et Bonpl.) Koster, nov. comb. — *Chuquiraga insignis* (Willd.) Humb. et Bonpl. var. *lancifolia* (Humb. et Bonpl.) Weddell, Chlor. And. 1, 1855, 3; Reiche, Fl. de Chile 4, 1905, 291 — *Chuquiraga lancifolia* Humb. et Bonpl., Pl. Aequin. 1, 1808, 153; Lessing in Linnaea 5, 1830, 259; DC., Prodr. 7, 1838, 9; Hieronymus in Engl. Bot. Jahrb. 29, 1900, 75.

Hab.: Häufiger Strauch in den Blockmoränen des Villocothales, 4500 m alt., Nov. 1911, n. 2477; Charakterstrauch des Moränenhügel im Viloco-Hochthal, 4500 m alt., Okt. 1911, Bl. orange, n. 2341.

Distr.: Ecuador, Bolivia, Chili borealis.

Obs.: Nomen speciei *Ch. Jussieui* Gmelin nomini *Ch. insignis* Humb. et Bonpl. aetate antecedit. Gmelin (Syst. Veg. T. 2, 1796, 1205) speciei, quam distinxit, quaeque tunc temporis unica erat, originem repetivit a Jussieu (Gen. Pl., 1791, 199, non 178). Nomen speciei *Ch. insignis* Humb. et Bonpl. sumptum est ex nomine "insignis", quod Willdenow speciei, cuidam generis Johannaie, indiderat, quo nomine genus *Chuquiragam* indicaverat (Spec. Pl. 3, 1800, 1705). Von Humboldt et Bonpland eam speciem, qua se usos esse ad genus constituendum declarant ("celle qui a servi à établir le genre"), quaeque necessario eadem species esse debet ac *Ch. Jussieui* Gmelin, rursus in genus *Chuquiragam* asciscunt (Pl. Aequin. 1, 1808, 153).

Chuquiraga armata Koster, nov. spec. (fig. 4, a—c).

Fig. 4 — *Chuquiraga armata* Koster, nov. spec. a: apex rami florescentis ($\times 1$); b: flos ($\times 2\frac{1}{2}$); c: anthera ($\times 5$) — *Lycoseris retroflexa* Koster, nov. spec. d: folium ($\times \frac{1}{2}$); e: capitulum cum foliis superioribus ($\times \frac{1}{2}$); f: flos radii ($\times 1\frac{1}{2}$); g: flos disci ($\times 1\frac{1}{2}$); h: anthera ($\times 2\frac{1}{2}$) — *Plazia acaciifolia* Koster, nov. spec. i: apex rami florescentis ($\times \frac{1}{2}$); k: folium ($\times \frac{1}{2}$); l: flos radii ($\times 1\frac{1}{2}$); m: flos disci ($\times 1\frac{1}{2}$); n: anthera ($\times 2\frac{1}{2}$); o: apex styli ($\times 5$) — *Hyaloseris quadriflora* Koster, nov. spec. p: capitulum ($\times 1$); q: folium ($\times \frac{1}{2}$); r: flos ($\times 1$); s: anthera ($\times 1\frac{1}{2}$) — *Hyaloseris boliviensis* Koster, nov. spec. t: folia ($\times \frac{1}{2}$); u: capitulum ($\times \frac{1}{2}$); v: flos ($\times 1$); w: anthera ($\times 2$).



Frutescens; rami purpurascens, glabri, rigidi, lenticellati, aculeis infra ramulos, supra stigmatem foliorum, quae deciderant, geminatis, rigidis, cinereis, 1—1½ cm longis, ½ mm crassis praeditis, circa 4 mm crassi; internodiis ½—1 cm longis; ramuli conferti, breves vel modice longi, sulcati, glabri vel pubescentes; cinnamomei, aculeis in axillis foliorum infra gemmam parvam subglobosam, geminatis, rigidis, rufescentibus, 1—1½ cm longis, circa ½ mm crassis praediti, circa 1 mm crassi; internodiis ½—1 cm longis. Folia alterna, petiolata, petiolo applanato, glabro, flavo, 3—4 mm longo, parte basali pulvinato, pubescenti, elliptica, apice abrupte acuminata, pungentia, aculeo rufo, basi attenuata, subacuta, integra, trinervia, herbacea, utrinque opaca, glabra, 1—4 cm longa, ½—1 cm lata. Capitula homogama, pedunculata, pedunculis brevibus, pubescentibus, 1—5 mm longis, apice ramulorum 2—5, conferta, pauciflora, cylindrica, circa 1½ cm longa, ½ cm crassa; involucrum cylindricum, imbricatum, 5-seriatum, 10—12 mm longum; squamis glabris, margine fimbriata excepta, flavis, nitentibus, rigidis, corneolis, apice acuminatis, pungentibus, exterioribus ovatis, interioribus ellipticis, recurvatis, extremis 4 mm longis. Flores bisexuales, circa 6; corolla tubulosa, 5-dentata, dentibus dimidia longitudinis, apice recurvatis, subacutis, glabra, interne longe et laxe pilosa, circa 8 mm longa. Antherae apice bifidae, mucronibus acutis, basi breviter bicaudatae. Stylus longe exsertus, glaber; ramis brevissimis, rotundatis. Achenium anguste cylindricum, striatum, longe et dense ferrugineo-pilosum, 5 mm longum; pappus setosus, ferrugineus, 7 mm longus setis plumosis. Receptaculum planum, dense pilosum, pilis longiusculis.

Hab.: Strauch an steinigen Abhängen bei Pojos, 2400 m alt., April 1911, n. 2023.

Obs.: A *Ch. ferox* (Weddell) Britt. differt, qui dioica, cuius capitula multiflora, corolla parte superiore pilosa.

Gochnatia H. B. K.

Gochnatia boliviana Blake in Contrib. U. S. Nat. Herb. 22, 1924, 651.

Hab.: auf kahlen steinigen Kämmen um Samaipata, 1900—2100 m alt., März 1911, n. 1757.

Distr.: Bolivia.

Obs.: Specimina, quae compararentur, praesto non erant, sed diagnosis speciei optime congruebat, nisi quod speciminis Herzogii squamae involucri in iuvenilibus tantum gemmis tomentulosae, mox glabrescentes erant et pubescentia in diagnosi Blakei ochroleuco-tomentulosa, speciminis Herzogii potius albide tomentulosa erat.

Lycoseris Cass.

Lycoseris retroflexa Koster, nov. spec. (fig. 4, d—h). — *Diazeuxis Herzogii* Beauverd in Herzog, Pfl. boliv. And., 1923, 121 (nomen nudum).

Frutescens; caulis rigidus, striatus, cinereo-tomentosus, 3—5 mm crassus; internodiis 1—1½ cm longis. Folia alterna, breviter petiolata, petiolo cinereo-tomentoso, 1—5 mm longo, 1—2 mm crasso, oblonga, apice acuminata, basi subrotundata vel obtusa, denticulata vel subintegra, herbacea, supra nitentia (in sicco), nigrescentia, subtus cinereo-tomentosa, pilis longis, arachnoideis, parte superiore retrorse curvata, marginibus saepe revolutis,

subtrinervia, nervis subtus prominentibus, lateralibus 2 utrinque, in parte basali, superioribus inaequaliter insertis, inferioribus multo tenuioribus, lamina 5—12 cm longa, $1\frac{1}{2}$ — $4\frac{1}{2}$ cm lata, superiora multo minora. Capitula terminalia solitaria, heterogama, late campanulata, 17—20 cm longa, 2— $2\frac{1}{2}$ cm crassa; involucrium campanulatum, imbricatum; squamis circa 7-seriatis, deerescentibus, lanceolato-oblongis, apice acuminatis, parce arachnoideo-tomentosis, 6—20 cm longis, 2—3 mm latis. Flores radii circa 10, steriles; corolla ligulata, interdum bilabiata, labio exteriori incurvato, lineari, 20 mm longa, ligula apice tridentata, 7 mm longa. Antherae desunt. Styli rami breves. Achenium abortivum; pappus setaceus, setis albidis, 9 mm longis. Flores disci numerosi, masculini; corolla tubulosa, parte superiore 5-lobata, 13 mm longa. Antherae apice acutae, basi longe bicaudatae. Stylus brevis. Achenium abortivum, pappus setaceus, 8 mm longus, setis albidis. Receptaculum planum, nudum.

Hab.: Strauch der Gebüschinseln in den Hügelfeldern von Palissa, 900 m alt., Déz. 1910, Bl. orange, n. 1263.

Cnicothamnus Griseb.

Cnicothamnus Lorentzii Griseb. in Abh. Kön. Ges. Wiss. Gött. 19, 1874, 149; Grisebach eod. 24, 1879, 211; Hieronymus, Pl. diaphor. fl. Argent., 1882, 165; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 141; R. E. Fries in Ark. f. Bot. 5, 1906, 28; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 43; Beauverd in Herzog, Pfl. boliv. And., 1923, 139, 156.

Hab.: Strauch und Zwergbäumchen an der Cuesta de Piedra Borracha, 1300 m alt., März 1911, n. 1731.

Distr.: Bolivia, Argentina.

Obs.: Variabilis quoad formam, pubescentiam et colorem foliorum, formam et numerum squamarum involucri.

Plazia Ruiz et Pav.

Plazia daphnoides Weddell var. **glabrescens** Weddell, Chlor. And. 1, 1855, 13 Pl. 2 fig. 1—7.

Hab.: kleiner Strauch an felsdurchsetzten Grashängen des Cerro Sipascocoye, 3500 m alt., April 1911, Bl. weiss, n. 2043.

Distr.: Bolivia.

Plazia acaciifolia Koster, nov. spec. (fig. 4, i—o).

Frutescens, rami lignosi, saepe flexuosi, glabri, circa 6 mm crassi; ramuli rigidi, erecti, sulcati, dense argenteo-sericei, extremi 1— $1\frac{1}{2}$ mm crassi; internodiis 2—20 mm longis. Folia alterna, sessilia, oblonga vel elliptica, minora sub lanceolata, basi subacuta vel obtusa, apice acuta, integra, rigida, pallide olivacea, iuniora utrinque sparse argenteo-sericea, pilis longis, erectis, mox glabrescentia, denique glaberrima, subcoriacea, 1— $7\frac{1}{2}$ cm longa, 4—17 mm lata, circa 5-nervia. Inflorescentia terminalis, umbellato-corymbosa, ramis argenteo-sericeis, saepe basi bractea elliptica vel lineari, 7—10 mm longa, 1—2 mm lata praeditis. Capitula pedunculata, pedunculis basi et medio saepe bractea minuta, ovata, apice acuta, argenteo-sericea praeditis, 1—10 mm longis, heterogama, campanulato-cylindrica, 2 cm longa, 7 mm crassa; involucrium cylindricum, imbricatum, 4—5-seriatum; squamis

exterioribus ovatis, 2 mm longis; interioribus oblongis, 8 mm longis, omnibus apice obtusis vel subacutis, striatis, pubescentibus. Flores bisexuales, 15 mm longi; radii 4—5, corolla bilabiata, labio exteriore ligulato, apice tridentato, revoluti, dentibus longis, subacutis, interiore bipartito, partibus linearibus, apice subacutis; disci 1—2, corolla tubulosa, parte superiore profunde partita, partibus 5, linearibus, apice acutis, revolutis. Antherae basi longe bicaudatae, apice acutae. Styli rami breves, apice truncati. Achenium turbinate, costatum, dense hirsutum, $2\frac{1}{2}$ mm longum; pappus setaceus, albus, 13 mm longus. Receptaculum parvum, planum, nudum.

Hab.: auf dem aufgetrockneten Boden einer Sumpflagune bei Ipaguazu, 540 m alt., 6 Nov. 1910, n. 1608.

Obs.: *Plazia argentea* (Don) O. K. var. β valde affines, sed differt i. a. foliis lanceolato-linearibus, apice longe acuminatis, argenteo-sericeis, capitulis minoribus ($1\frac{1}{2}$ cm longis), involuero 3—4-seriato, squamis acutiusculis, corollis inter se similibus.

Lophopappus Rusby.

Lophopappus foliosus Rusby in Bull. Torrey Bot. Club 21, 1894, 487 Pl. 225; Rusby in Mem. Torrey Bot. Club 4, 1895, 213; Beauverd in Herzog, Pfl. boliv. And., 1923, 209.

Hab.: Hügel über Titikakasee, n. 2505/a (fragmentum).

Onoseris DC.

Onoseris hastata Weddell, Chlor. And. 1, 1855, 9 Pl. 7; R. E. Fries in Ark. f. Bot. 5, 1906, 29; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 30 — *Chaptalia triangularis* Beauverd in Herzog, Pfl. boliv. And., 1923, 164.

Hab.: an steinigten Abhängen zwischen Sunchal und Pojos, 2200 m alt., April 1911, n. 2004.

Distr.: Bolivia australis, Argentina borealis.

Obs.: Differt pedunculis tenuioribus (1 mm crassis), curvatis et dentibus foliorum lateralibus maioribus (ad $\frac{1}{2}$ cm longis), dentibus basalibus introrsum directis et ala petioli interdum angustissima. Forsan forma, quaedam propter loci, ubi crescit, naturam diversa.

Mutisiae.

Barnadesia Mutis

Barnadesia polyacantha Weddell, Chlor. And. 1, 1855, 13 Pl. 1 A; Schultz-Bip. in Bull. Soc. Bot. de France 12, 1864, 79; Schultz-Bip. in Linnaea 18, 1865—1866, 527; Britton in Bull. Torrey Bot. Club 19, 1892, 265; Rusby in Mem. Torrey Bot. Club 3, 1893, 65; Buchtien, Contr. Fl. de Boliv. 1, 1910, 196; Weberbauer, Pfl. peruan. And., 1911, 237; Beauverd in Herzog, Pfl. boliv. And., 1923, 72, 78, 161, 167, 183, 188, 191, 195, 211, 219.

Hab.: Strauch mit überhängenden Ästen im Nebelwald der Bergkämme bei Comarapa, 2600 m alt., April 1911, Bl. hellrosa, n. 1938.

Distr.: Bolivia, Peruvia (Andes).

Obs.: Weddell in diagnosi haec dicit: "les trois (fleurs) centrales tubulées, ayant quatre divisions à peu près égales, et une cinquième beau-

coup plus longue"; ita etiam perspicue delineavit, Pl. 1 A, fig. 8, 9, 10. Flores disci speciminis Herzogii habent corollam apice dentibus 5, modice longis, consimilibus, ita ut nullus ex eis ceteros longitudine superet. Specimen Buchtienii, Herb. Boliv. s.n., Unduavi, 3300 m alt. (in Herb. Lugd. Bat.) habet unum capitulum, in quo duo flores disci corollam habent apice 5-dentatam, dentibus subsimilibus, ita tamen, ut corolla altius fissas sit inter dentem secundum et tertium; floris disci tertii corolla, id quod imago Weddellii ostendit, dente uno longiore lineari praedita est. Dolendum est summam corollam corrosam deesse; attamen dixeris 4 dentes esse eosque subsimiles. Indicium igitur supra indicatum, quod Weddell descripsit, variare apparet. Secundum Hoffmann (in Engler et Prantl, Nat. Pfl. Fam. 4, 5, 1894, 342) corolla florum disci huius generis zygomorpha, certe apicis eius divisio inaequali altitudine est. Haec ab specimine Herzogii aliena sunt, sed in specimen Buchtienii quadrant.

Hyaloseris Griseb.

Sectio *Grapheioseris* Koster, nov. sect.

Hyaloseris quadriflora Koster, nov. spec. (fig. 4, p—s).

Probabiliter frutescens; rami subteretes, plerumque glaberrimi sed nonnullis locis albide arachnoideo-lanosi, purpurascens vel badii, sublaevi, superiores 2—4 mm crassi; internodiis 3—7 cm longis, stigmatibus foliorum quae deciderant, albo-lanatis. Folia opposita, in sicco caduca, breviter petiolata, petiolo 3—6 mm longo, lanceolato-elliptica, sparse denticulata, dentibus parvis, pungentibus, apice mucronulata, basi acuta, supra primum sparse albide arachnoideo-lanata, mox glaberrima, subtus arachnoideo-lanata, rigida, chartacea, pinninervia, nervo mediano prominente, lateralibus utrinque circa 6, non prominentibus, laminibus $3\frac{1}{2}$ —7 cm longis, 8—20 mm latis, superioribus minoribus. Capitula congesta in apice ramorum, saepe trinis in apice pedunculorum brevium, albide lanatorum, circa $\frac{1}{2}$ cm longorum, in axillis foliorum parvorum, breviter pedunculata, pedunculo albide lanato, circa 3 mm longo, homogama, 4-flora, oblonga, 3— $3\frac{1}{2}$ cm longa, circa $\frac{1}{2}$ cm crassa; involucrium turbinato-cylindricum, 6-seriatum, circa 17 mm longum, 6 mm crassum, squamis decrescentibus, plus minusve altera alteri superpositis, plus minusve divaricatis, lanceolatis, apice longe acuminatis, pungentibus, rigidis, scariosis, glaberrimis, margine lanato-fimbriata excepta. Flores bisexuales; corolla ligulata, apice revoluta, 5-dentata, dentibus obtusis, 4-nervis, 28 mm longa, ligula 17 mm longa, 5 mm lata. Antherae apice acuminata, basi bicaudata, caudis longis, apice obtusis, fimbriatis. Styli rami elongati, obtusi. Achenium oblongum, 5-striatum, badium, glabrum, 9 mm longum, 1 mm crassum; pappus setaceus, flavo-ferrugineus, 23 mm longus, setis divaricatis, rigidis, decrescentibus, scabris, extremis 6 mm longis. Receptaculum parvum, convexum, nudum.

Hab.: an sonnigen Felsabhängen des Cerro San Pedro bei Cochabamba, 2700 m alt., Aug. 1911, n. 2461.

Obs.: Haec species una cum *Hyaloseride camataquiensi* Hieron. ad separatam sectionem generis *Hyaloseridis* pertinet, cui nomen *Grapheioserin* dedi. Cum diagnosis *H. camataquiensis* Hieron. data non sit, eam hic leges.

Hyaloseris camataquiensis Hieron. in Fiebrig, Pl. austro-boliv. 1903—1904, n. 3067; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 43.

Probabiliter frutescens; rami teretes, striati, multiramosi, glaberrimi, argenteo-cinerei, 2—3 mm crassi, internodiis $1\frac{1}{2}$ —2 cm longis; ramuli oppositi, arcuati, rigidi, glaberrimi, badii, $1\frac{1}{2}$ mm crassi, internodiis $\frac{1}{2}$ —2 cm longis, stigmatibus foliorum, quae deciderant, albo-lanatis. Folia opposita, brevissime petiolata, petiolo glabro, $\frac{1}{2}$ —1 mm longo, vel subsessilia, elliptica, apice rotundata vel minutissime mucronata, basi acuta, integra, utrinque glabra, parte basali utrinque 3-nervis haud insignibus, 8—25 mm longa, 2—7 mm lata. Capitula in apice ramulorum solitaria, cylindrica, homogama, 5-flora, 23 mm longa, 6 mm crassa; involucrium turbinato-cylindricum, 6-seriatum, 15 mm longum, 5 mm crassum; squamis decrescentibus, plus minusve altera alteri superpositis, oblongis, apice acutis, naviculiformibus, rigidis, scariosis, glaberrimis, parte superiore saepe nigrescente purpureo-maculatis. Flores bisexuales, corolla ligulata, apice 5-dentata, dentibus obtusis, 4-nervis, 21 mm longa, ligula 9 mm longa, 3 mm lata. Antherae apice acuminatae, basi longe bicaudatae, caudis apice acutis, fimbriatis. Styli rami elongati, acuti. Achenium oblongum, 5-striatum, glabrum, 6 mm longum, 1 mm crassum; pappus setaceus, sordide purpureo-rufus, 14 mm longus, setis rigidis, scabris, decrescentibus, extremis 2 mm longis. Receptaculum parvum, convexum, nudum.

Hab.: Camataqui, 2500 m alt., 10 Febr. 1904, Fiebrig n. 3067.

Obs.: Librum, cui titulus: Hieronymus, Ic. et deser. Rep. Argent., 1885, 35, inspicere mihi non licuit; itaque suspicione tantum pono Hieronymus eo loco genus *Dinoserin* Griseb. in genus *Hyaloserin* transtulisse, recte meo quidem indicio. *Dinoserin* sectio *Hyaloseris* habenda est, quod genus has sectiones complectitur:

Euhyaloseris: folia alterna, capitula 5-flora; Argentina.

Grapheioseris: folia opposita, capitula 4- vel 5-flora; Bolivia.

Dinoserin (Griseb.): folia opposita, capitula multiflora; Argentina, Bolivia.

Sectio *Dinoserin* (Griseb.).

Hyaloseris boliviensis Koster, nov. spec. (fig. 4, t—w).

Frutescens, rami glabri, teretes, striati, 4—5 mm crassi, internodiis $3\frac{1}{2}$ —7 cm longis; ramuli ut rami, sed $1\frac{1}{2}$ —3 mm crassi, internodiis 2—4 cm longis. Folia alterna, petiolata, petiolis brevibus, 1—5 mm longis, elliptica, utrinque acuta, integra vel minutissime denticulata, pinninervia, nervo mediano subtus prominente, lateralibus utrinque 5—6, supra sparse albide arachnoideo-lanata, subtus glabra, chartacea, 2— $4\frac{1}{2}$ cm longa, 1—2 cm lata. Capitula terminalia, in apice ramulorum, campanulata, circa 15-flora, homogama, circa 4 cm longa, circa $2\frac{1}{2}$ cm crassa; involucrium campanulatum, imbricatum; squamis decrescentibus rigidis, scariosis, glaberrimis, stramineis, interioribus lanceolato-oblongis, naviculiformibus, apice acutis vel obtusis, circa 28 mm longis, 3—5 mm latis, mediis ovatis, apice obtusis, circa 17 mm longis, 9 mm latis, exterioribus subrotundatis vel semirotundatis, 6—7 mm in diam., saepe nonnullis minoribus paullo inferiore loco insertis. Flores bisexuales, corolla ligulata, circa 3 cm longa, ligula apice 5-dentata, dentibus obtusis, revoluta, 4-nervis, $1\frac{1}{2}$ cm longa, 4 mm lata. Antherae apice acuminatae, basi longe bicaudatae, caudis apice fimbriatis, subobtusis. Styli rami elongati, apice obtusi. Achenium oblongum, triquetrum vel quattuor lateribus, saepe costatum, glabrum, badium, 5—

6 mm longum; pappus setaceus; sordide albus, 23 mm longus, setis decreescentibus scabris. Receptaculum subplanum, nudum.

Hab.: Strauch in der Dornbuschsteppe zwischen Pulquina arriba und Comarapa, 1800 m alt., April 1911, Bl. hellgelb, n. 1798.

Obs.: A *D. salicifolia* Griseb. iam statim differt forma foliorum.

Proustia Lag.

Proustia angustifolia Weddell, Chlor. And. 1, 1855, 24; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 168.

Hab.: Strauch in den Geröllalluvionen der Ebene von Cochabamba, 2800 m alt., Mai 1911, Bl. weiss, n. 2076; kleines Bäumchen oder Strauch an steinigten Abhängen bei Totora, Charakterpflanze, ca 2700 m alt., April 1911, n. 2021.

Distr.: Bolivia.

Obs.: Diagnosis bene congruit; attamen in specimine Herzogii n. 2076 nonnulla folia spinuloso-dentata, foliis ceteris integerrimis ut in diagnosi; pubescentia non semper densa, interdum subglabra.

Proustia pungens Poepp. ex Lessing, Syn. Gen. Comp., 1832, 110; DC., Prodr. 7, 1838, 27; Weddell, Chlor. And. 1, 1855, 23; Schultz-Bip. in Bull. Soc. Bot. de France 12, 1864, 79; Grisebach in Abh. Kön. Ges. Wiss. Gött. 19, 1874, 151; Grisebach eod. 24, 1879, 212; Hieronymus, Pl. diaphor. fl. Argent., 1882, 166; Britton in Torrey Bot. Club 19, 1892, 266; Rusby in Mem. Torrey Bot. Club 3, 1893, 66; R. E. Fries in Nov. Act. Reg. Soc. Upsal. Ser. 4, 1, 1, 1905, 92; Reiche, Fl. de Chile 4, 1905, 306; Buchtien, Contr. Fl. de Boliv. 1, 1910, 196; Beauverd in Herzog, Pfl. boliv. And. 1923, 169, 209, 216.

Hab.: Charakterstrauch in der Felsheide bei Teneria, 3000 m alt., Nov. 1911, n. 2468/b; trockene Abhänge bei La Paz, ca. 3900 m alt., n. 2501/a (fragmentum, foliis $6\frac{1}{2}$ cm longis, 3 cm latis).

Distr.: Bolivia, Chili, Argentina borealis.

Mutisia L.

Sectio Pinnatisectae DC., Prodr. 7, 1838, 5.

Mutisia viciaefolia Cav., Icon. 5, 1799, 62, T. 490; Weddell, Chlor. And. 1, 1855, 15; Schultz-Bip. in Bull. Soc. Bot. de France 12, 1864, 79; Schultz-Bip. in Linnaea 18, 1865—1866, 527; Britton in Bull. Torrey Bot. Club 19, 1892, 265; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 164; Reiche, Fl. de Chile 4, 1905, 314; R. E. Fries in Ark. f. Bot. 5, 1906, 31; Buchtien, Contr. Fl. de Boliv. 1, 1910, 196; Fiebrig in Engl. Bot. Jahrb. 45, 1911, 17, 28; Weberbauer, Pfl. peruan. And., 1911, 114, 128, 129, 164—166, 169, 170, 177; Beauverd in Herzog, Pfl. boliv. And., 1923, 78, 82, 176; Cabrera in Not. prelim. Mus. de la Plata 3, 1934, 165.

Hab.: an sonnigen Abhängen im Slavethal bei Cochabamba, 2900 m alt., Mai 1911, n. 2092.

Distr.: Peruvia, Bolivia, Chili borealis, Argentina.

Obs.: Ligula florum radii ad 3 cm longa; apex rhachidis foliorum semper terminans in duo cirros.

Mutisia Bipontini Mandon ex Rusby in Mem. Torrey Bot. Club 6, 1896, 68; Schultz-Bip. in Bull. Soc. Bot. de France 12, 1864, 79; Schultz-

Bip. in Linnaea 18, 1865—1866, 527; Britton in Bull. Torrey Bot. Club 19, 1892, 265 — prob. *Mutisia Bipontia* Mandon in Weberbauer, Pfl. peruan. And. 1911, 237 — *Mutisia lanata* var. *Bipontini* Beauverd in Herzog, Pfl. boliv. And., 1923, 195.

Hab.: im Bergwald über Tablas, 3300 m alt., Mai 1911, n. 1981/a; im Bergwald des Jungas de San Mateo, rankend, April 1911, Bl. hochrot, 2400 m alt., n. 1981.

Distr.: Bolivia, prob. Peruvia (Andes).

Mutisia Vicia Koster, nov. spec. (fig. 5, a—e).

Frutescens, scandens; rami subangulati vel sulcati, parte superiore sordide albo-lanati, deinde glabrescentes, 3—4 mm crassi; internodiis $\frac{1}{2}$ —4 cm longis. Folia alterna, subsessilia, pinnatipartita, 5—9 cm longa; rhachide tereti, interdum angustissime alata, sordide albo-lanata, 1 mm crassa, in cirrum simplicem vel bifidum terminante, $\frac{1}{2}$ —1 cm longum; foliolis 6—9 utrinque suboppositis vel alternis, sessilibus vel breviter petiolatis, petiolo 1—2 mm longo, ellipticis vel oblongis, utrinque acutis, chartaceis, supra obscuris, nitentibus, iuvenilibus parce arachnoideis, subtus dense sordide albo-lanatis, margine parce revolutis, pinninerviis, nervis flexuosis, 2—4 utrinque, 1—3 cm longis, 3—10 mm latis, iuvenilibus minoribus; gemmis albo-rufescentibus in axillis nonnullis. Capitula pedunculata, pedunculo sordide albo-lanato, $1\frac{1}{2}$ —3 cm longo, bracteis 2—3 subtriangularibus, apice acutissimis, sordide albo-lanatis praedito, $4\frac{1}{2}$ —5 cm longa; involucrium cylindricum, 6—7-seriatum, circa $3\frac{1}{2}$ cm longum, 7—10 mm crassum; squamis laxe imbricatis, purpurascens, exterioribus late ovatis, apice acutis, extremis revolutis parte medii subglabra excepta sordide albo-lanatis, 3—15 mm longis, 4—6 mm latis, interioribus lanceolato-oblongis, apice acutis vel breviter acuminatis, margine apicis lanata excepta glabris. Flores radii feminei, 5—6, corolla ligulata, ligula late elliptica, apice tridentata, circa 15-nervis, ad basin appendicibus 2, filiformibus, 1 cm longis praedita, parte corollae inferiore filiformi, 3 cm longa; corolla 17 mm longa, 8 mm lata. Stylus longe exsertus, ramis brevibus, obtusis. Flores disci bisexuales, circa 10, corolla 33 mm longa, parte superiore 7 mm longa, tripartita, parte latissima 5-nerviis, apice 3-dentata, dentibus subacutis, partibus ceteris angustissimis, apice subacutis. Antherae apice acutae, basi longe bicaudatae, florum radii desunt. Styli rami breves, elliptici, apice subobtusiusculi. Achenium immaturum angulatum, glabrum; pappus setaceus, rufescens, $1\frac{1}{2}$ cm longus, setis plumosis. Receptaculum subplanum, nudum.

Hab.: in Gebüsch sonniger Abhänge bei Comarapa, rankend, 2300 m alt., April 1911, Bl. ziegelrot, n. 1974.

Fig. 5 — *Mutisia Vicia* Koster, nov. spec. a: apex rami florescentis ($\times \frac{1}{2}$); b: flos radii ($\times \frac{3}{4}$); c: flos disci ($\times \frac{3}{4}$); d: anthera ($\times 1\frac{1}{2}$); e: apex styli ($\times 5$) — *Mutisia Flagellaria* Koster, nov. spec. f: folia ($\times \frac{1}{2}$); g: capitulum, cuius flores deciderant ($\times 1$); h: capitulum iuvenile ($\times \frac{1}{2}$); i: flos radii ($\times 1$); k: flos disci ($\times 1$); l: anthera ($\times 5$); m: apex styli ($\times 5$); n: achenium floris radii ($\times \frac{3}{4}$); o: achenium floris disci ($\times \frac{3}{4}$) — *Chaetanthera boliviensis* Koster nov. spec. p: pars plantae florescentis ($\times 1$); q: capitulum ($\times 1\frac{1}{2}$); r: squama involucri ($\times 2$); s: flos radii ($\times 4$); t: flos disci ($\times 5$); u: anthera ($\times 4$); v: stylus ($\times 5$) — *Perezia nitidifolia* Koster, nov. spec. w: planta florescens ($\times \frac{1}{2}$); x: flos ($\times 1$); y: anthera ($\times 3$); z: apex styli ($\times 5$).



Obs.: *M. Lehmanni* Hieron. valde affinis, nisi quod haec species differt pedunculis 5—10 cm longis, corollae florum radii lobis interioribus vix 2 mm longis, 16 floribus disci, corolla longiore et forma diversa.

Sectio Pinnativenosae DC., Prodr. 7, 1838, 6.

Mutisia prob. **cochabambensis** Hieron. in Engl., Bot. Jahrb. 19, 1894, 74 — *Mutisia camptosorifolia* Rusby in Mem. Torrey Bot. Club 4, 1895, 213; Beauverd in Herzog, Pfl. boliv. And. 1923, 229.

Hab.: rankend im Gebüsch der Berge über Guaqui am Titikaka-see, 3900 m alt., Nov. 1911, n. 2509.

Obs.: Nulla specimina vidi, quae compararem. Diagnosis Rusbyi quodammodo congruit; differt autem in his rebus: involucri speciminis Herzogii $2\frac{1}{2}$ —3 cm, in diagnosi $3\frac{1}{2}$ cm longum est; caulis speciminis Herzogii plerumque non-alatus, interdum anguste alatus (ala circa $\frac{1}{2}$ mm lata), sed nonnullis locis ala breviter et sparse dentata, locis aliis integra. Hieronymus hoc tantum commemorat alam, si adsit, integram esse; Rusby alae nullam mentionem facit.

Mutisia Flagellaria Koster, nov. spec. (fig. 5, f—o).

Subfrutescens, scandens, rami saepe flexuosi, subteretes, striati, glabri, parte superiore trialati, alis plerumque integris, interdum parce dentatis, dentibus acutis vel acutissimis, glabris, $\frac{1}{2}$ —3 mm latis; internodiis 1— $5\frac{1}{2}$ cm longis. Folia alterna, brevissime petiolata, petiolis circa 1 mm longis, lanceolata, apice in cirrum simplicem terminantia, $1\frac{1}{2}$ — $2\frac{1}{2}$ cm longum, basi sagittata, dentibus acutissimis, ceterum integra, chartacea, utrinque glaberrima, supra obscure viridia, nitentia, infra pallidiora, nervo medio infra prominente, reticulatione insigni, sine cirro 3—10 cm longa, parte latiore $\frac{1}{2}$ —2 cm lata, apicem caulis versus decrescentia, ad 1 cm longa, 2 mm lata, extremo apice albo-lanata; allabastra parva, albo-lanata, in axillis foliorum. Capitula terminalia, solitaria, 4—5 cm longa, $1\frac{1}{2}$ — $2\frac{1}{2}$ cm crassa; involucri cylindrico-campanulatum, 5—6-seriatum; squamis imbricatis, decrescentibus, exterioribus late ovatis, apice longe mucronatis, interioribus late ellipticis ad elliptico-oblongis, apice truncatis vel late rotundatis brevissime mucronulatis, margine apicis albo-lanatis, omnibus glabris, purpureis, parte media 10—12 nervis praeditis, exterioribus 5—10 mm longis, 5—8 mm latis, interioribus 16—28 mm longis, 9—10 mm latis. Flores radii feminei, circa 8; corolla ligulata, glabra, circa 32 mm longa, ligula elliptica, apice bi- vel tridentata interdum ad basin appendicibus filiformibus praedita, 16 mm longa, 5 mm lata; flores disci bisexuales, numerosi; corolla tubulosa, parte superiore tripartita, partibus revolutis, parte latissima apice tridentata, corolla circa 28 mm longa. Antherae apice acutae, basi longe bicaudatae, in floribus radii abortivae. Styli rami satis longi, apice rotundati; in floribus radii stylus plerumque abortivus. Achenium oblongum, parce curvatum, utrinque attenuatum, glabrum, obscurum, 12 mm longum; florum radii triquetrum, 3 mm crassum, disci quadrangulum, 1 mm crassum; pappus setaceus, rufescens, circa $2\frac{1}{2}$ cm longus, florum radii setis scabris, florum disci plumosis. Receptaculum hirsutum.

Hab.: windend und rankend im Gebüsch des Araca-Thalgehanges, 3500 m alt., Okt. 1911, n. 2362.

Obs.: *M. cochabambensi* Hieron. affinis, a qua differt foliis latioribus, caule alis insignioribus praedito, capitulis maioribus, forma involucri et

squamorum involucri interiorum. A *M. decurrente* Cav. differt foliis petiolatis, basi sagittatis, apice in cirrum semper simplicem terminantibus et squamorum involucri partis superioris forma. *M. decurrens* Cav. valde variabilis quoad foliorum, folia plerumque integra, interdum acutissime grosse dentata vel nonnullis dentibus in parte superiore vel utrinque dente uno in parte basali praedita, sed semper sessilia decurrentia, apice in cirrum plerumque bifidum, interdum simplicem terminantia; squamae involucri gradatim attenuatae ad apicem.

Sectio *Uninerviae* DC., Prodr. 7, 1838, 7.

Mutisia Orbignyana Weddell, Chlor. And. 1, 1855, 22; Grisebach in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 211; Hieronymus, Pl. diaphor. fl. Argent., 1882, 164; Rusby in Mem. Torrey Bot. Club 3, 1893, 65; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 164; R. E. Fries in Ark. f. Bot. 5, 1906, 31; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 18; Weberbauer, Pfl. peruan. And. 1911, 133; Beauverd in Herzog, Pfl. boliv. And., 1923, 216, 228.

Hab.: an steinigen Abhängen über Oruro, 3750 m alt., Sept. 1911, n. 2442.

Distr.: Bolivia, Peruvia (Andes).

Mutisia ledifolia Deene ex Weddell, Chlor. And. 1, 1855, 20; O. Kuntze, Rev. Gen. Pl. 3, 2, 1898, 164; R. E. Fries in Nov. Act. Reg. Soc. Upsal. Ser. 4, 1, 1, 1905, 94; Buehtien, Contr. Fl. de Boliv. 1, 1910, 196; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 18; Weberbauer, Pfl. peruan. And. 1911, 133; Beauverd in Herzog, Pfl. boliv. And., 1923, 229; Cabrera in Not. preliminar. Mus. de la Plata 1, 3, 1934, 166.

Hab.: auf Hügeln über Guaqui am Titikasee, 3900 m alt., Nov. 1911, n. 2505.

Distr.: Bolivia, Argentina borealis.

Nonnulli loci caulis et nonnulli capitula cecidia formant.

f. longiflora Koster, nov. f. — ligula florum radii ad $2\frac{1}{2}$ cm longa.

Hab.: an felsigen Abhängen langs des Rio Cuchupunata, kleiner Strauch, Strahlblüten oben weiss, 2900 m alt., April 1911, n. 2019.

Chaetanthera R. P.

Chaetanthera boliviensis Koster, nov. spec. (fig. 5, p—v).

Parva, herbacea, reptans, 4—10 cm longa, caules numerosi, striati, tenues, flexuosi, $\frac{1}{2}$ mm crassi, maiore ex parte subterranea, radicibus filiformibus, distantibus praedito, in parte illa internodiis 2—7 mm longis, foliis squamaeformibus, oppositis, binis cruciatis, sessilibus, appressis, basi adnatis, ovatis, apice subobtusis, brunneis, utrinque glabris, 1 mm longis, in axillis saepe ramulos contractos breves ferentibus. Folia superiora congesta, opposita, bina cruciata, sessilia, lanceolata, apice subacuta, basin versus dilatata, prob. crassulis, margine saepe incurva, supra subglabra vel longe albide et crispe arachnoideo-lanatis, subtus glabra, 3—7 mm longa, circa 1 mm lata. Capitula terminalia, solitaria, inclusa in foliis superioribus, heterogama, campanulata, 7—8 mm longa, 5—6 mm crassa; involucrum campanulatum, multi-seriatum, 7—8 mm longum; squamis 2-seriatis, oblongis, apice subacutis, parte media 3-nervia, parte superiore viridi-nigra, marginibus latis, membranaceis, non-coloratis, integris, glabris, circa 2 mm latis; exterioribus brevioribus. Flores radii steriles, circa 10; corolla bilabiata, 6 mm longa, labio exteriori ligulato, 2 mm longo, apice tridentato,

dentibus brevibus latis, interiore bifido, dentibus modice longis, divaricatis, acutissimis. Stylus clavaeformis, parte apicali breviter bifida. Antherae deficientes. Flores disci fertiles, circa 20; corolla tubuliformis, circa 4 mm longa, bilabiata, labio exteriori convexo, apice tridentato, dentibus brevissimis, interiore bifido, dentibus longis, acutissimis. Antherae apice acutae, basi longe bicaudatae. Styli rami brevissimi, deltoidei. Achenium omnium florum oblongum, glabrum, 1 mm longum; pappus setaceus, albus, caducus, circa $4\frac{1}{2}$ mm longus. Receptaculum parvum, planum, nudum.

Hab.: an sonnigen, begrasten Erdhängen von Choquecatachico, 4600 m alt., Okt. 1911, n. 2339, typus; in *Lepidophyllum*-rasen an sonnigen Schutthängen des Chojuacota Thales, 4900 m alt., Okt. 1911, n. 2339/a.

Obs.: *Ch. acerosa* (Remy) Benth. et Hook. valde affinis; a *Ch. boliviensi* differt i. a. foliis utrinque breviter lanatis, longioribus, 8—12 mm longis, squamis involucri diversis. Labium interius corollae florum radii *Ch. acerosae* habet dentes brevissimos; hi dentes sunt multo maiores et divaricati in *Ch. boliviensi* (cf. Weddell, Chlor. And. 1, 1855, Pl. 9 B).

Trichocline Cass.

Trichocline reptans (Weddell) Robinson in Proc. Amer. Acad. 49, 1913, 515 — *Bichenia reptans* Weddell, Chlor. And. 1, 1855, 25 Pl. 8 B — *Trichocline auriculata* Beauverd (non Hieronymus) in Herzog, Pfl. boliv. And. 1923, 98.

Hab.: auf den trockenen Campos bei Waynybe und Cumbarute, 800 m alt., Dez. 1910, n. 1153.

Distr.: Bolivia, Argentina.

Obs.: Nulla specimina vidi, quae compararem. Diagnosis et imago Weddellii quodammodo congruunt. Specimina Herzogii folia maiore ex parte integra sunt, nonnulla autem lobis paucis brevibus praedita. *T. incana* Cass. valde affinis, sed differt i. a. collo radicis dense albo-lanato (cf. Lam., Ill. t. 679, fig. 3). Attamen Grisebach (in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 214) et Hieronymus (Pl. diaphor. fl. Argent., 1882, 165) *Bicheniam reptantem* Weddell synonymam *T. incanae* Cass. ducunt.

Chaptalia Vent.

Chaptalia nutans (L.) Polak. in Linnaea 41, 1877, 582; Baker in Mart., Fl. Bras. 6, 3, 1882—1884, 377; Hieronymus, Pl. diaphor. fl. Argent. 1882, 166; Britton in Bull. Torrey Bot. Club 19, 1892, 266; Hieronymus in Engl., Bot. Jahrb. 29, 1900, 81; Hieronymus in Engl., Bot. Jahrb. 28, 1901, 653; Chodat in Bull. Herb. Boiss., Sér. 2, 1, 1901, 411; Chodat eod. 2, 1902, 400; Chodat et Hassler eod. 3, 1903, 781; R. E. Fries in Ark. f. Bot. 5, 1906, 31; Hassler in Trab. Mus. Farmac. Med. de Buenos Aires 21, 1909, 132; Buchtien, Contr. Fl. de Boliv., 1910, 196; Hicken, Chlor. Plat. Argent., 1910, 269; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 61; Heering in Schellenberg, Schinz, Thellung in Mem. Soc. Neuchâtel Sci. Nat. V, 1913, 431; Beauverd in Herzog, Pfl. boliv. And., 1923, 222; Knuth in Fedde, Repert. Beih. 43, 1928, 732; Standley in Contr. U. S. Herb. 27, 1928, 386; Herter, Estud. Bot. Urug. 4, 1930, 131; Malme in Kungl. Sv. Vet. Akad. Handl., ser. 3, 12, 1933, 115; Bornmueller in Rev. Sudamer. Bot. 2, 1935,

46; Moore in Fawcett et Rendle, Fl. Jamaica 7, 1936, 280 fig. 98; Bullock in Hooker, Icon. Pl., 1937, t. 3345; Yuncker in Bot. Ser. Field Mus. Nat. Hist. 17, 1938, 400; Standley eod. 18, part 4, 1938, 1440; Koster in Pulle, Fl. Surin. 4, 1938, 165 — *Leria nutans* DC. in Schultz-Bip. in Bull. Soc. Bot. de France 12, 1864, 79; Schultz-Bip. in Linnaea 18, 1865—1866, 527; Grisebach in Abh. Kön. Ges. Wiss. Gött. 19, 1874, 149; Grisebach eod. 24, 1879, 215.

Hab.: in Wald bei Villa Montes (Rio Pilcomayo), 460 m alt., Nov. 1910, n. 1139.

Distr.: America centralis cum insulis Indiae occidentalis et America australis usque in Argentinam et Uruguay.

Chaptalia piloselloides (Vahl) Baker in Mart., Fl. Bras. 6, 3, 1882—1884, 378; Arechavaleta, Fl. Urug. 3, 1906, 431; Perkins in Engl., Bot. Jahrb. 49, 1913, 232; Herter, Estud. Bot. Urug. 4, 1930, 131; Malme in Ark. f. Bot. 24 A, 1932, 83; Malme in Kungl. Sv. Vet. Akad. Handl., ser. 3, 12, 1933, 115 — *Perdicium piloselloides* Vahl in Skrivt. Naturhist. Selsk. Kiøbenh. 2, 2, 1783, 38 Tab. V.

Hab.: auf steinigen Bergtriften bei Samaipata, 1800 m alt., März 1911, n. 1897.

Distr.: Venezuela, Brasilia, Colombia, Bolivia, Argentina, Uruguay. an var. **graminifolia** Malme ? in Kungl. Sv. Vet. Akad. Handl., ser. 3, 12, 1933, 115.

Hab.: auf den Hügelfeldern des Cerro de Charagua, 1400—1600 m alt., Dez. 1910, n. 1257.

Distr.: Brasilia.

Obs.: Haec specimina incendio adusta esse videntur; nihilominus folia media cognosci possunt; sunt linearia, $5\frac{1}{2}$ —8 cm longa, 2 mm lata; capitula iuvenilia. Malme tradit speciminum suorum folia 10—20 cm longa, 3—5 mm lata esse.

Chaptalia prob. **ebracteata** (O. Ktze) K. Schum. in Just, Jahresber. 26, Abt. 1, 1898, 376 — *Thyrsanthema ebracteata* O. Kuntze, Rev. Gen. Pl. 3, 1893, 182.

Hab.: auf steinigen Bergtriften bei Samaipata, 1800 m alt., März 1911, n. 1897/a.

Distr.: Bolivia.

Obs.: Diagnosis O. Kuntzii admodum brevis est; ea tamen, quae tradit, cum specimine Herzogii conveniunt, nempe omnibus partibus *Ch. nutans* nostram speciem magnitudine bis terve superat, pedunculus ebracteatus, achenii crassitudo aequalis, achenium ipsum non rostratum, pubescens est.

Nassauvinæ.

Polyachyrus Lag.

Polyachyrus oblongiflorus Koster, nov. spec. (fig. 6, a—b).

Herbaceus, ad 25 cm latus, caule vetustiore caulem novum 25—30 cm longum formante. Caulis subangulatus vel subteres, irregulariter foveolatus, parce albo-arachnoideus, 4—6 mm crassus, internodiis $\frac{1}{2}$ — $2\frac{1}{2}$ cm longis, superioribus longioribus. Folia alterna, sessilia, pinnatipartita, lobis utrinque circa 6, alternis vel suboppositis, oblongis, apice acutis et mucronatis, irregulariter lobatis (superiorum minorum subintegris exceptis), 1—2 cm longis, 2—7 mm latis, lobulis 1—3, deltoideis, apice acutis, mucronatis, 2—10 mm

longis, 1—4 mm latis, lobo supremo tripartito, partibus apice acutis, mucronatis, nervo mediano anguste alato (ala $\frac{1}{2}$ —1 mm lata utrinque), parte inferiore non-lobata $2\frac{1}{2}$ —4 cm longa, basin versus dilatata, basi subdeltoidea, subamplexicauli, folia supra glabra, minute verruculosa, subtus albobrachnoidea, forsan carnosula, 10—15 cm longa, 3—5 cm lata; in axillis foliorum saepe gemma albo-lanata vel ramulus brevis. Glomeruli capitulorum terminales vel apice ramorum superiorum vel in axillo foliorum supe-



Fig. 6 — *Polyachyrus oblongiflorus* Koster, nov. spec. a: folium ($\times 1$); b: capitula ($\times 1$).

riorum, 1—2, oblongi, circa 2 cm longi, circa $1\frac{1}{2}$ cm crassi, pedunculo 1—2 cm longo; receptaculo glomeruli elongato, albo-lanato, paleis lineari-lanceolatis, apice acutissimis, striatis, glabris, 6 mm longis. Capitula numerosa, minuta, compressa, 2-flora, 4 mm longa, $1\frac{1}{2}$ mm lata; involucri squamae 5, inaequales, exteriore naviculaeformi, ceteras involventi, apice acuta, margine membranacea, sine callo ad basin, ceteris oblongis, apice acutis vel serrulatis, membranaceis. Flores juveniles; corolla bilabiata, labio uno apice tridentato, dentibus subacutis, altero bidentato, dentibus longis,

acutis. Pappus paleaceus, paleis linearibus, margine plumosis, albis, in flore externo brevissimis, in flore interno probabiliter corollae acquilongis. Receptaculum minutum.

Hab.: Chili, im Geröll der Felswüste des Küstengebirges bei Antofagasta, 250 m alt., Sept. 1911, n. 2320.

Obs.: Differt a *P. tenuifolio* Philippi habitu non elongato, auriculis minoribus, lobis folii oblongis, apice acutis, mucronatis, pedunculo non-elongato. Differt a *P. San Romani* Philippi lobis folii apice acutis, mucronatis, glomerulis capitulorum oblongis, involucri squama externa sine callo.

Perezia Lag.

Sectio *Euperezia* Gray, Syn. Fl. N. Am. ed. 1, i. pt 2, 1884, 408.

Perezia coerulescens Weddell, Chlor. And. 1, 1855, 39, Pl. 10 A; Schultz-Bip. in Bull. Soc. Bot. de France 12, 1864, 79; Schultz-Bip. in Linnaea 18, 1865—1866, 527; Rusby in Mem. Torrey Bot. Club 3, 1893, 66; Weberbauer, Pfl. peruan. And., 1911, 114, 199 fig. 27, 203 fig. 35 F, 212, 222, 224, 225, 227; Perkins in Engl., Bot. Jahrb. 49, 1913, 232; Beauverd in Herzog, Pfl. boliv. And., 1923, 179, 180, 217, 218.

Hab.: auf kurzrasigen mageren Triften des Cerro de Palca, 4600 m alt., Mai 1911, Bl. blaulila, n. 2089.

Distr.: Cordillera de los Andes: Peruvia, Bolivia, 4000—5000 m alt.

Perezia cirsiifolia Weddell, Chlor. And. 1, 1855, 41; Schultz-Bip. in Bull. Soc. Bot. de France 12, 1864, 79; Schultz-Bip. in Linnaea 18, 1865—1866, 528; Beauverd in Herzog, Pfl. boliv. And., 1923, 210.

Hab.: in feuchten Felsspalten des Cerro Chaucapina, 5100 m alt., Okt. 1911, Bl. cremegelb, n. 2351.

Distr.: Bolivia, 5100 m alt.

Obs.: Diagnosis Weddellii fere congruit; differt autem magnitudine plantarum. Orbis foliorum radicalium speciminum Herzogii 7—9 cm in diam., folia 3—5 cm longa, 7—15 mm lata, pedunculi 5 mm longi; in diagnosi Weddellii plus quam 20 cm in diam., folia circa 10 cm longa, 2—3 cm lata, pedunculi circa 2 cm longi. Attamen in specie altera *Pereziae*, ab Herzogio collecta (n. 2177), magnitudo plantarum valde variabilis, orbibus foliorum radicalium 6—14 cm in diam., foliis 3½—6½ cm longis, 5—15 mm latis. Folia in diagnosi Weddellii membranacea, speciminum Herzogii potius chartacea. Capitula speciminum Herzogii subsessilia vel pedunculata, pedunculis ad 2 cm longis.

Perezia nitidifolia Koster, nov. spec. (fig. 5, w—z) — *Perezia violacea* Beauverd (non Weddell) in Herzog, Pfl. boliv. And., 1923, 180.

Herbacea, perennis, acaulis. Radices ramis fere carentes, circa 1½ mm crassae. Folia crebre rosulata, sessilia, spatulato-oblonga, apice acuta, mucronata, grosse dentata vel pinnatilobata vel pinnatifida, dentibus mucronatis, interdum subintegra, margine spinuloso-ciliata, utrinque glaberrima, (sub lente) crebre glanduloso-punctata, nitentia, flavo-viridia (in sicco), chartacea, nervo mediano basin versus incrassato, nervis lateralibus numerosis, indistinctis, 3—7 cm longa, ½—1½ cm lata. Capitula modice numerosa, in axillis foliorum, subsessilia vel pedunculata, pedunculis ½—3½ cm longis, bracteatis saepe, bracteis 0—7, foliaceis, sessilibus, lanceolato-oblongis, apice

acutis, parte inferiore margine membranaceis, integris, pallidis, trinerviis, parte superiore spinuloso-ciliatis, (sub lente) crebre glanduloso-punctatis, nitentibus, flavo-viridibus (in sicco), ad 16 mm longis, 2—5 mm latis, cylindrica, circa 2 cm longa, circa 12 mm crassa; involucrium cylindricum, imbricatum, squamis decrescentibus, 4—5-seriatis, exterioribus oblongo-ovatis, ceteris lanceolato-oblongis, apice mucronatis, integris, exterioribus apice spinuloso-ciliatis exceptis, membranaceis, pallidis, 15—20 mm longis, 2—6 mm latis. Flores bisexuales, circa 30; corolla bilabiata, glabra, 23 mm longa; labio inferiore apice minutissime tridentato, denique incurvato, 4-nervi, 7 mm longo, 3 mm lato, superiore bifido, partibus filiformibus, incurvatis, 7 mm longis, tubo 15 mm longo, 1 mm crasso. Antherae apice acutae, basi longe bicaudatae. Styli rami breves, apice truncati, penicillati. Achenium immaturum oblongum, subcostatum, subglabrum, 2 mm longum; pappus setaceus, ferrugineus, 15 mm longus; setis numerosis, scabris. Receptaculum planum, nudum.

Hab.: auf moorig-sandigen Wiesen des Plateaus bei Palca, 3600 m alt., Mai 1911, Bl. hellblau, n. 2177.

Obs.: *P. violacea* Weddell differt forma foliorum, foliis glanduloso-puberulis. A *P. integrifolia* Weddell differt foliis obsolete sinuatis et opacis, tamen valde affinis.

***Perezia aracensis* Koster, nov. spec. (fig. 7, a—d).**

Herbacea, perennis, rhizoma obliquum, apice folia subrosulata pauca, circa 5, parte inferiore reliquias foliorum vietorum nonnullorum et caulem foliferum in axillis folii portante. Folia basalia congesta, alterna, spathulato-lyrata, apice rotundata, abrupte breviter mucronata, basin versus attenuata in petiolum, parte inferiore runcinata, dentibus utrinque 1—4, latis, saepe obtusis, interdum acutis, mucronulatis, spinuloso-ciliata, glanduloso-pubescentia, infra pallidiora, pinninervia, nervo mediano basin versus incrassato, nervis lateralibus obscuris, 4—6 cm longa, $1\frac{1}{2}$ —2 cm lata; petiolo elongato, basin versus incrassato, prob. carnosus, glabro, pallido, nitente, parte inferiore alata, alis membranaceis 6—7 cm longo. Caulis $1\frac{1}{2}$ mm crassus, parte superiore glanduloso-pubescente, inferiore glabra; folia nonnulla, circa 5, et in apice capitula 3 ferens; internodia $\frac{1}{2}$ — $2\frac{1}{2}$ cm longa; folia caulina alterna, sessilia, anguste vel late elliptica, apice mucronulata, basi truncata, parce dentata vel subintegra, spinuloso-ciliata, utrinque glanduloso-pubescentia, infra pallidiora, herbacea, superiora capitula in axillis portantia, $1\frac{1}{2}$ — $2\frac{1}{2}$ cm longa, $\frac{1}{2}$ — $1\frac{1}{2}$ cm lata. Capitula pedunculata, pedunculo crebre glanduloso-pubescente, 6—8 mm longo, circa $1\frac{1}{2}$ mm crasso, cylindrica, circa 18 mm longa, circa 1 cm crassa; involucrium cylindricum, imbricatum; squamis decrescentibus, 4—5-seriatis, exterioribus late ellipticis, apice mucronatis, mucrone subulato, dentatis, dentibus apice subulatis, spinuloso-ciliatis, glanduloso-pubescentibus, circa 8 mm longa, 5 mm lata, nervo

Fig. 7 — *Perezia aracensis* Koster, nov. spec. a: planta florescens ($\times \frac{1}{2}$); b: flos ($\times 1$); c: anthera ($\times 3$); d: apex styli ($\times 5$) — *Perezia scalpellifolia* Koster, nov. spec. e: folium ($\times \frac{1}{2}$); f: apex rami florentis ($\times \frac{1}{2}$); g: flos ($\times 1\frac{1}{2}$); h: apex styli ($\times 5$); i: anthera ($\times 3$) — *Perezia obtusisquama* Koster, nov. spec. k: folium ($\times \frac{1}{2}$); l: apex rami florentis ($\times \frac{1}{2}$); m: flos ($\times 1$); n: anthera ($\times 3$); o: apex styli ($\times 5$) — *Trixis rigida* Koster, nov. spec. p: folium ($\times \frac{1}{2}$); r: apex rami florentis ($\times \frac{1}{2}$); s: flos ($\times 2$); t: anthera ($\times 6$); v: apex styli ($\times 5$).



mediano prominente; interioribus oblongis, apice mucronatis, mucrone subulato, integris, parce glanduloso-pubescentibus vel subglabris, margine stramineis, 10—18 mm longis, 3—4 mm latis. Flores bisexuales, 15—20; corolla bilabiata, 25 mm longa, labio inferiore apice tridentato, 4-nervato, 10 mm longo, 3 mm lato, superiore incurvato, bifido, angusto, 5 mm longo, 1 mm lato. Antherae apice acutae, basi longe bicaudatae. Styli rami breves, truncati, penicellati. Achenium immaturum oblongum, costatum, 2 mm longum; pappus setaceus, fulvus, 12 mm longus, setis scabris.

Hab.: an einem Wassergraben bei Araca, 4400 m alt., Dez. 1910, leg. C. Bock n. 2480/b.

Obs.: *P. viscosa* Less. affinis, sed differt forma foliorum, capitulis longe pedunculatis, multo latioribus, campanulatis.

Perezia scalpellifolia Koster, nov. spec. (fig. 7, e—i).

Perennis, herbacea. Caulis scapiformis, foliatus, glaberrimus, striatus, capitula 1—3 in apice ferens, 20—33 cm longus, 1—1½ mm crassus; folia caulina sessilia, bracteacea, linearia, apice subulata, coriacea (prob. carnosula), glaberrima, laete-virentia, rigide pectinato-ciliata, nervo mediano prominente, ½—4 cm distantia, 5—18 mm longa, 1—1½ mm lata. Folia basalia rosulata, 5—8, longe petiolata, elliptico-spathulata, apice mucronulata, mucrone rigido, pungente, basi longe attenuata in petiolum, integra, rigide pectinato-ciliata, setis 1 mm longis, pungentibus, nonnullis maioribus regulariter distantibus, coriacea (prob. carnosula), utrinque glaberrima, laete-virentia, nitentia, nervo mediano insigni, nervibus lateralibus indistinctis, 6—8, 5—14 cm longa, 1—3 cm lata; petiolo glaberrimo, plerumque purpurascens, parte inferiore dilatato, 6—14 cm longo, circa 1 mm lato. Capitula solitaria vel 2—3, longe pedunculata, in apice caulis, si tria ad sunt uno ceteris inferiore, campanulato-cylindrica, circa 2 cm longa, 8—12 mm crassa; pedunculi cauli similes, sed 2—3 cm longi, ½ mm crassi; involucrium cylindricum, 6—7-seriatum, imbricatum, 1½ cm longum; squamis decrescentibus, exterioribus ovatis, interioribus oblongis, omnibus apice mucronulatis, integris, margine membraceis, pallidioribus, parte superiore purpureis, 2 mm latis, exterioribus 5 mm longis. Flores bisexuales, 10—15; corolla bilabiata, labio inferiore ligulato, apice tridentato, 4-nervi, 7 mm longo, 1½ mm lato, superiore minutissimo, incurvato, bifido. Antherae apice acutae, basi longe bicaudatae, nigrescentes. Styli rami breves, apice truncati, penicillati. Achenium immaturum, oblongum, compressum, costatum, breviter glanduloso-pubescent, 2 mm longum; pappus setaceus, 12 mm longus, ferrugineus; setis scabris. Receptaculum planum, nudum.

Hab.: auf den höchsten Bergwiesen bei Comarapa, ca. 2800 m alt., April 1911, Bl. hellblau, n. 1915.

Obs.: *P. laurifolia* O. Ktze affinis, sed differt caule apice glanduloso-pubescente, foliis sessilibus, forma foliorum, capitulis crassioribus, squamis involucri apice longe acuminatis.

var. ***parvifolia*** Koster, nov. var. — caules 2, monocephali. Folia supra obscuriora, 2½—5½ cm longa, 1—1½ cm lata, setis marginis brevioribus, ½ mm longis. Involucri squamae latiores, ad 4 mm latae.

Hab.: in Grashängen des Cerro Sipascaye, 3900 m alt., April 1911, n. 1915 bis.

Perezia obtusisquama Koster, nov. spec. (fig. 7, k—o). — *Perezia pungens* var. *obtusisquama* Beauverd in Herzog, Pfl. boliv. And., 1923, 180.

Herbacea, circa $\frac{1}{2}$ m alta. Caulis parte superiore ramosus, foliatus, striatus, parte superiore (an glanduloso?) hirsutus, pilis rubris, multicellularibus, saepe longiuseulis, $1\frac{1}{2}$ —4 mm crassus, parte inferiore 9—10 cm longa, foliis carens; internodiis $1\frac{1}{2}$ —4 cm longis; ramis in axillis foliorum superiorum, parce foliatis, foliis parvis, (an glanduloso?) hirsutis, 2—9 cm longis, $\frac{1}{2}$ —1 mm crassis. Folia basalia rosulata, pauca (circa 4), oblongo-spathulata, longissime attenuata in petiolum anguste alatum, longum, rubescens, 5—8 cm longum, apice acutissima, margine spinulosa, spinulis $\frac{1}{2}$ —2 mm longis, rigida, chartacea, glabra, nervo mediano infra prominenti, nervis lateralibus utrinque 9—12, arcuate connexis, extremis grosse reticulatis, 7— $12\frac{1}{2}$ cm longa, $1\frac{1}{2}$ — $2\frac{1}{2}$ cm lata; caulina alterna sessilia, ovato-oblonga, apice longe attenuata, acutissima, basi semiamplexicaulia, cordata, lobis rotundatis, margine spinulosa, spinulis $\frac{1}{2}$ —2 mm longis, saepe acutissime serrata, dentibus apice pungentibus, rigida, chartacea, subglabra vel disperse (an glanduloso?) hirsuta, pilis brevibus multicellularibus, nervis ut in foliis basalibus, sed lateralibus utrinque 5—8, 2—9 cm longa, 7—20 mm lata. Capitula in apice caulis et ramulorum, homogama, campanulata, circa 22 mm longa, circa 2 cm crassa; involucrium campanulatum, imbricatum, 4—5-seriatum, 19 mm longum; squamis oblongis, exterioribus ovato-oblongis, apice mucronulatis, margine membranaceis, integris, extrema ex eis lanceolata spinulosa excepta, parte media brevissime pubescentibus, 7—17 mm longis, 3—4 mm latis. Flores bisexuales, numerosi; corolla bilabiata, parte media breviter hirsuta, 22 mm longa, labio inferiore ligulato, apice tridentato, 4-nervi, circa 1 cm longo, 2 mm lato, superiore incurvato, bifido, angusto. Antherae apice acutae, basi longe bicaudatae. Styli rami breves, truncati, penicillati. Achenium immaturum, oblongum, costatum, breviter strigillosum, 3 mm longum; pappus setaceus, ferrugineus, 13 mm longus, setis scabris. Receptaculum planum, nudum, glabrum.

Hab.: auf Alpenwiesen über Tablas, 3400 m alt., Mai 1911, Bl. blau, n. 2163.

Obs.: *P. pungens* Less. differt glabritie et foliis basalibus lanceolatis vel obovato-oblongis, sinuato-dentatis vel runcinatis (fide Weddellii), vel grosse et argute serratis (fide Lessingii). *P. multicapitata* Weddell differt foliis basalibus pinnatisectis. *P. carduncelloides* Griseb. differt capitulis multo tenuioribus et squamis involucri externis foliaceis.

Trixis P. Browne

Trixis divaricata (H. B. K.) Spreng., Syst. Veg. 3, 1826, 501; D. Don in Trans. Linn. Soc. 16, 1829, 190, 229; Lessing in Linnaea 5, 1830, 31; DC., Prodr. 7, 1838, 69; Grisebach in Abh. Kön. Ges. Wiss. Gött. 24, 1879, 216; Baker in Mart., Flor. Bras. 6, 3, 1882—1884, 384 T. 104 fig. 1; Britton in Torrey Bot. Club 19, 1892, 266; Chodat in Bull. Herb. Boissier, Sér. 2, 2, 1902, 399; Chodat et Hassler eod. 3, 1903, 782; R. E. Fries in Ark. f. Bot. 5, 1906, 31; Arechavaleta, Fl. Urug. 3, 1906, 442; Rusby in Bull. N. Y. Bot. Gard. 4, 1907, 400; Buehtien, Contr. Fl. de Boliv. 1, 1910, 197; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 57; Knuth in Fedde, Repert. Beih. 43, 1928, 732; Herter, Estud. Bot. Urug. 4, 1930, 132; Standley in Bot. Ser. Field Mus. Nat. Hist. 18, part. 4, 1938, 1529 — *Perdicium divaricatum* H. B. K., Nov. Gen. 4, 1820, 155 T. 355 — *Trixis auriculata* Hook. in Curtis, Bot. Mag. 1 N. S., 1827, 2765.

Hab.: in Hecken bei Samaipata, spreizend, 1700 m alt., März 1911, Bl. weiss, n. 1671.

Distr.: Costa Rica, Brasilia, Venezuela, Peruvia, Bolivia, Argentina, Paraguay.

Obs.: Specimen Herzogii plane congruit cum specimine Fiebrigii: Pl. austro-boliv. 1903—1904 n. 2661 (in Herb. Lugd. Bat.). Specimina boliviensia habent folia auriculata, ut in var. *typica*, sed nonnihil differunt a ceteris speciminibus in Herb. Lugd. Bat. (praecipue brasiliensibus) pedicellis brevioribus, quo factum est, ut capitula aliquanto magis constipentur. Forsan specimina boliviensia referenda sunt ad varietatem *odoratissimam* Baker in Mart., Fl. Bras. 6, 3, 1882—1884, 385.

Trixis rigida Koster, nov. spec. (fig. 7, p—v).

Subherbacea. Caulis erectus, rigidus, teres, rugosus (in sicco), apice striatus, glaber, apice glanduloso-pubescenti excepta, viridis vel ferrugineus, plus quam 30 cm longus, 3—4 mm crassus; internodiis $1\frac{1}{2}$ — $1\frac{1}{2}$ cm longis; ramulis brevibus, folia parva conferta ferentibus. Folia alterna, sessilia, lanceolata, utrinque attenuata, apice acuta, basi auriculata, auriculis rotundatis, minute dentata, margine saepe revoluta, utrinque strigosa, supra glandulosa, caesio-viridia, herbacea, nervo mediano insigni, pallido, infra prominenti, nervis lateralibus utrinque 7—12, marginem non attingentibus, reticulatione indistincta, 1—8 cm longa, 2—15 mm lata, superiora minora. Inflorescentia terminalis, copiose corymboso-paniculata, ramosa, 10 cm longa et lata; ramulis in axillis foliorum parvorum, rigidis, attenuatis, superne striatis, angulum acutum cum caule efficientibus, glanduloso-pubescentibus, eiusdem coloris, qui foliorum, 1— $1\frac{1}{2}$ mm crassis. Capitula pedunculata, pedunculo bracteato, bracteis 2—3, parvis, linearibus, acutis, dense glanduloso-pubescentibus, 2—4 mm longis, 6—20 mm longo, campanulata, homogama, circa 12-flora, 15—18 mm longa, circa 6 mm crassa, involucrium campanulatum, 2-seriatum; squamis lanceolatis, acuminatis, naviculaeformibus, carinatis, striatis (striis subrubescentibus), glanduloso-pubescentibus, flavo-viridibus, margine ciliatis, exterioribus brevioribus, 4—6 mm longis, interioribus 11 mm longis. Flores bisexuales; corolla bilabiata, breviter pubescens, circa 7 mm longa; labio interiore ligulato, apice revoluta, tridentato, dentibus subobtusis, extrinsecus pilosis, circa 3 mm longo, superiore bifido, partibus ligulatis, apice extrinsecus pilosis, revolutis. Antherae apice acutae, basi longe bicaudatae. Styli rami modice breves, apice truncati, breviter penicillati, brunnei. Achenium lineari-oblongum, apicem versus attenuatum, apice denique applanato, patelliformi, subcostatum, glandulosum, circa 6 mm longum; pappus setaceus, subrufescens, circa 8 mm longus, setis scabris. Receptaculum planum, pilosum.

Hab.: in den Geröllalluvionen der Ebene um Cochabamba, 2800 m alt., Mai 1911, n. 2078.

Obs.: *T. divaricata* (H. B. K.) Spreng. clare differt inflorescentia magis congesta eiusque ramulis rigidis et foliis lanceolatis. A *T. radiale* (L.) Urb. differt foliis sessilibus, basi auriculatis.

Steinbach n. 9705 est eadem species.

Jungia L. f.

Jungia divaricata Rusby in Mem. Torrey Bot. Club 6, 1896, 71; Fiebrig, Pl. Austro-boliv., 1903—1904, 2172; R. E. Fries in Ark. f. Bot.,

5, 1906, 32; Fiebrig in Engl., Bot. Jahrb. 45, 1911, 56 — *Jungia nutans* Bauverd in Herzog, Pfl. boliv. And., 1923, 169.

Hab.: Hochstaude im Geröll der Gebirgsbäche am Rand der Ebene von Cochabamba, 800 m alt., Mai 1911, Bl. weiss, n. 2062.

Distr.: Bolivia.

***Jungia sordida* Koster, nov. spec.**

Herbacea, alta, plus quam $1\frac{1}{2}$ m longa; caulis subteres, medullusus, striatus, sparse hirsutus, pilis longis, multicellularibus, saepe crispis, ferrugineis, circa $1\frac{1}{2}$ mm longis, inflorescentia excepta ramis carens, parte superiore purpurascens, $\frac{1}{2}$ —1 cm crassus. Folia alterna, petiolata, petiolo hirsuto eodem modo quo caulis, 1—10 cm longo, circa 2 mm crasso, auriculis in basi petioli late ovatis vel subrotundatis, irregulariter grosse dentatis, dentibus acutis, hirsutis eodem modo quo folia, nervis parallelis, 2— $3\frac{1}{2}$ cm longis, 1— $3\frac{1}{2}$ cm latis; lamina subrotunda vel late ovato-rotundata, palmatim lobata, lobis circa 11, apice obtusis, irregulariter grosse serratis, dentibus latis, obtusis, basi cordata, chartacea, supra sparse, subtus praesertim in nervis hirsuta eodem modo quo petiolus, pilis inter nervis tenuioribus, paucicellularibus, 7-nervia, nervis palmatim, parte superiore ramosis, reticulatione subtus prominentibus, 8—16 cm longa et lata. Inflorescentia terminalis, tenuiter paniculata, elongata, ampla, ramis et ramulis elongatis, tenuibus, in axillis foliolorum lancolato-ellipticorum, sessilium, apice acutum, hirsutorum eodem modo quo folia, $\frac{1}{2}$ — $1\frac{1}{2}$ cm longorum. Capitula cylindrico-campanulata, homogama, circa 12-flora, pedunculata, pedunculo tenui, bracteis 0—3 minutis, linearibus, hirsutis praedito, 2—20 mm longo, 5 mm crassa; involucrium campanulatum, uniseriatum, 6 mm longum; squamis 8, florem involventibus, hirsutis, marginibus membranaceis exceptis. Flores bisexuales; corolla bilabiata, alba, labio inferiore ligulato, apice tridentato, 3—8 mm longo, $1\frac{1}{2}$ —2 mm lato, superiore bifido, partibus linearibus, apice acutis. Antherae apice acutae, basi bicaudatae, caudis modice brevibus, apice acutis. Styli rami breves, incurvati, apice dilatati, truncati, hirsuti. Achenium lineare, papilloso-hirsutum, $2\frac{1}{2}$ mm longum; pappus setaceus, sordidus, 5 mm longus, setis plumosis. Receptaculum planum, paleaceum, paleis florem involventibus, oblongis, acuminatis, apice ciliatis, membranaceis.

Hab.: auf subalpinen Wiesen der Abra de la Senda, 2300 m alt., März 1911, n. 1839.

Obs.: A *J. floribunda* Less. differt pubescentia, involucrio, achenio papilloso-hirsuto, colore pappi.

***Jungia Herzogiana* Bauverd in Herzog, Pfl. boliv. And., 1923, 188, nomen nudum (fig. 8, 1—10).**

Herbacea, alta, superne ramosa, plus quam $\frac{1}{2}$ m longa. Caulis subteres, cavus, striatus vel plus minusve costatus, superne hirsutus, pilis multicellularibus, rubescentibus, inferne glabrescens, deinde glaber, 3—7 mm crassus. Folia alterna, petiolata, petiolo hirsuto eodem modo quo caulis, 2—6 cm longo, $1\frac{1}{2}$ —3 mm crasso, auriculis in basi petioli late ovatis vel subrotundatis, apice acutis, dentatis, supra scabre hirsutis, subtus subglabris, reticulatione prominenti, chartaceis, $1\frac{1}{2}$ —2 cm longis et latis; lamina subrotundata (margine in specimine Herzogii corrossa), palmatim lobata, lobis 7—9, obtusis vel subacutis, dentatis, supra hirsuta, subtus glabra, nervis parce



Fig. 8 — *Jungia Herzogiana* Beauverd 1: fragment de tige, avec feuille caulinaire supérieure à pétiole (= 60 mm lg., limbe = 140 mm lg. \times 210 mm lat., stipules, st = 25 mm lg.); 2: inflorescence complète à feuilles raméales lancéolées et sessiles (panicule = 280 mm lg. dès le premier noeud à feuilles non stipulées); 3: capitule (= 12 mm lg.); 4: foliole de l'involucre extérieur (superf. = $4 \times 1\frac{1}{2}$ mm), avec différents types du trichome en a, b, c et d (gr. \times 92 diam.); 5: foliole de l'involucre intérieur (superf. = 9×2 mm) et types de son trichome en e, f et g; 6: écailles des fleurs du centre (superf. = 8×1 mm); 7: fleur du rayon (= 14 mm lg., achaine = 5 mm, tube = 4 mm, limbe = 7 mm; soies du pappus = 6–7 mm lg.), avec pubescence de l'achaine en h et i, coupe transversale en j; 8: étamine = $4\frac{1}{2}$ mm lg. (languette = $1\frac{1}{2}$ mm, connectif = $1\frac{1}{2}$ mm, caudicules = $1\frac{1}{2}$ mm, anthéropode = $\frac{3}{4}$ mm lg.); 9: style = 7 mm lg.; 10: extrémité d'une branche de stigmat (X 50) et grain de pollen en p (X 92) — ex Beauverd.

hirsutis exceptis, chartacea, 7-nervia, reticulatione praesertim subtus prominente, 9—15 cm longa, 13—21 cm lata; superiora minora, 2—4 cm longa, 3—5 cm lata. Inflorescentia terminalis, et praeterea in axillis foliorum superiorum inserta, paniculata, ramosa, ampla. Capitula in apice ramulorum tenuium, elongatorum, hirsutorum, bracteis linearibus, minutis, circa 5 mm longis et interdum gemmis praeditis, numerosa, campanulata, homogama, circa 22-flora, circa 12 m longa et crassa; involucrum uni-seriatum, foliolis 2 minutis, hirsutis, 4—5 mm longis extrinsecus insertis, circa 9 mm longum; squamis 8, oblongis, apice acutis, parte media hirsutis, partibus lateralibus membranaceis, glabris, florem involventibus. Flores bisexuales; corolla bilabiata, labio inferiore ligulato, apice tridentato, 7 mm longo, 2 mm lato, superiore bifido, partibus linearibus, incurvatis, apice acutis. Antherae apice acutae, basi bicaudatae, caudis modice brevibus, apice acutis. Styli rami breves, incurvati, apice dilatati, truncati, hirsuti. Achenium linearis-ampulliforme, papilloso-scaber, 5 mm longum; pappus setaceus, sordidus, 6 mm longus, setis plumosis, differentibus longitudine. Receptaculum planum, paleaceum, paleis florem involventibus, oblongis, acutis, apice fimbriatis, ciliatis, membranaceis.

H a b.: im Gebüsch der Waldgrenze über Tablas, 3400 m alt., Mai 1911, Bl. weiss, n. 2191.

O b s.: A *J. sordida* Koster differt i. a. pubescentia rariore et capitulis maioribus, tamen valde affinis.

Steinbach n. 9810 est eadem species.

A NEW SPECIES OF ARGYREIA FROM SUMATRA
(CONVOLVULACEAE)

by

S. J. VAN OOSTSTROOM

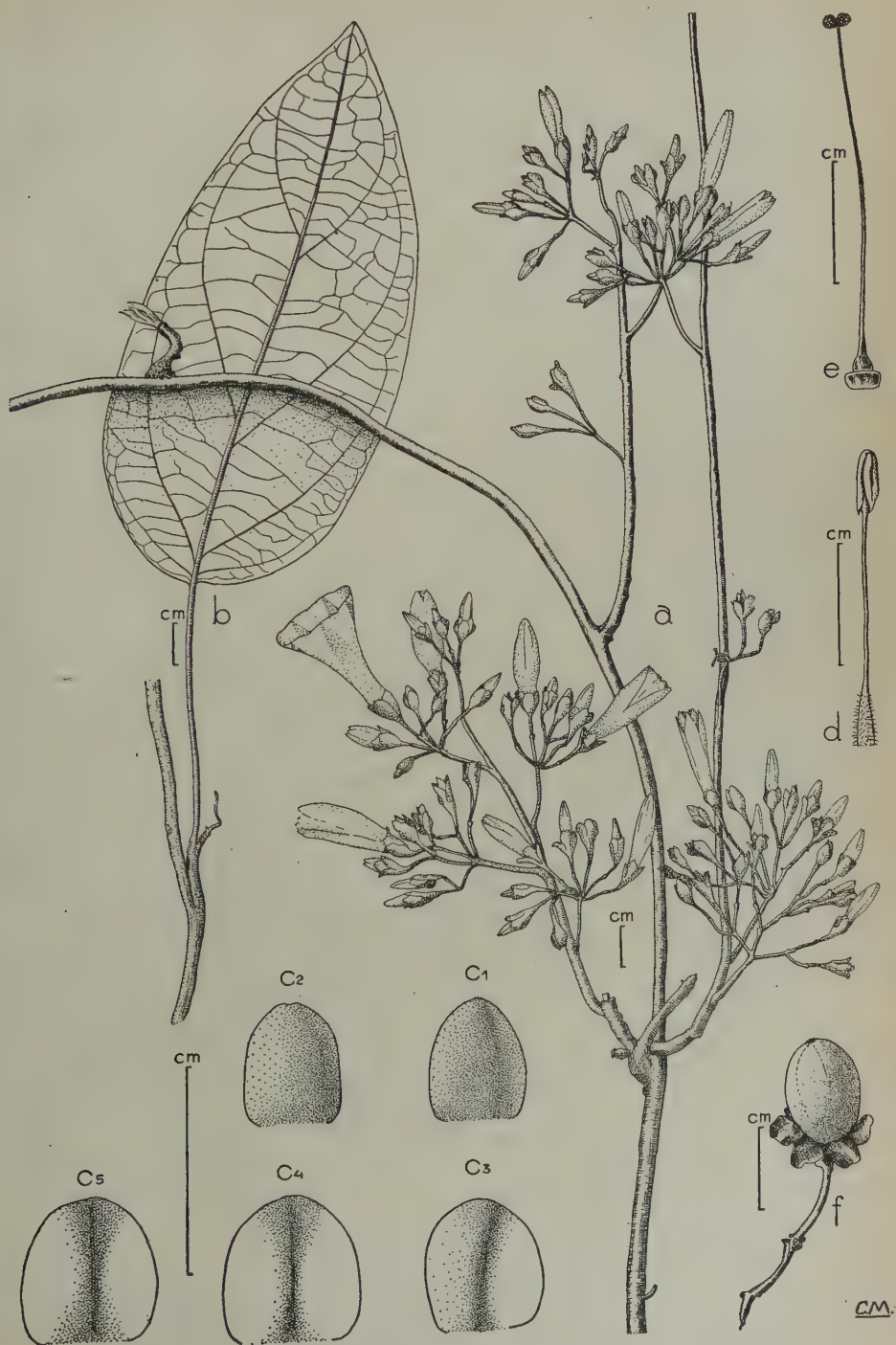
(Rijksherbarium, Leiden)

(Issued December 31st, 1945).

***Argyreia nuda* Van Ooststr., nov. spec. — Fig. 1.**

Frutex scandens. *Caules* in statu florigero foliis destituti, internodiis longis, usque ad 18 cm metientibus, in nodis ramulos laterales breves vel apicem versus inflorescentias emittentes. Ramuli laterales folia nonnulla vel inflorescentias gerentes, internodiis multo brevioribus vel brevissimis. Caules teretes vel juniores obscure angulati, griseo-brunnei, in sicco longitudinaliter hinc inde transversaliter rugosi, juniores pilis brevibus adpressis praediti, adultiores glabri, plusminusve verrucosi (lenticellati). *Folia* petiolata; *petiolo* breviter et adpresse piloso ut in partibus junioribus caulis, supra sulcato, ad 6 cm longo; *lamina* ovato-oblonga, apice breviter acuminata, basi \pm rotundata (vel in foliis junioribus late cuneata), nervis exceptis glabra, 11—15 cm longa, 5—6 cm lata; nervo mediano nervis lateralibus utrinque c. 4 et nervis secundariis \pm parallelis subtus prominentibus supra impressis. *Inflorescentiae* in axillis foliorum delapsorum caulium primariorum vel ramulorum lateralium, primo casu umbellato-cymosae, 4—8- vel usque ad c. 20-florae, secundo casu etiam umbellato-cymosae, sed praeterea in paniculam conjunctae. *Pedunculi* praesertim apicem versus applanati, 10—24 mm longi, adpresse pilosi, pilis ut in ramulis junioribus, apice umbellato-cymosi; ramuli adpresse pilosi; *pedicelli* 4—7 mm vel in flore centrali ad 10 mm longi, basi \pm dense, apicem versus \pm sparse adpresse pilosi. *Sepala* glabra vel prope basin extrinsecus sparse pilosa, exteriora duo late ovata apice rotundata vel paullo retusa, c. 6 mm longa; sepalum tertium paullo obliquum, elliptico-orbiculare, c. 6—6.5 mm longum, margine uno latere tenuiore; sepala duo interiora elliptico-orbicularia, c. 6.5 mm longa, marginibus tenuioribus. *Corolla* infundibuliformis, c. 3.5 cm longa, alba, limbum versus rosea vel violacea, limbo paullo lobato, c. 4—4.5 cm diam., fasciis mesopetalis glabris. *Filamenta* c. 10 mm supra basin corollae inserta, c. 20 mm longa, basi dilatata pilosa; *antherae* lineari-

Fig. 1. — *Argyreia nuda* Van Ooststr.; a: branch of the type specimen, *Binnemeijer* n. 436; b: leaf of the specimen *Binnemeijer* n. 375; c₁—c₅: sepals 1—5; d: stamen; e: pistil; f: fruit of the specimen *Binnemeijer* n. 375.



lanceolatae, 5—6 mm longae. *Stylus* filiformis c. 27 mm longus, glaber; *ovarium* oblongo-ovoidum, glabrum, 4-loculare; *stigmata* globosa, papillosa. *Discus* annularis, integer, c. 1½ mm altus. *Bacca* ovoidea, c. 14 mm longa, violacea.

SUMATRA, West Coast, Ophir district, N.-W. slope of Mount Talakmau, 900 m alt., *H. A. B. Bünnemeijer* n. 436, fl. April 25, 1917 (Climber in forest. Flowers white at base, violet above when young); W. slope of Mount Talakmau, 600 m alt., *H. A. B. Bünnemeijer* n. 375, fl. April 24, 1917 (In forest. Flowers white, pink above; fruit violet; vern. name: *akar katjan pariwo*). Both specimens in herb. Buitenzorg; n. 436 is the *typus florum*; n. 375 is the *typus foliorum et fructuum*.

The description has been based on the two specimens collected by Mr Bünnemeijer on the slopes of Mount Talakmau, Ophir district, West Coast of Sumatra. Of these n. 436 consists of a flowering branch only, with several inflorescences but without leaves; n. 375 is a branch with only one young inflorescence and with a few leaves on short lateral shoots. It may be supposed that the species flowers when all or nearly all leaves have fallen off.

A remarkable character of this new species is found in the externally quite glabrous corolla; this is in contradistinction with the other species of *Argyreia*, where the midpetaline bands of the corolla are generally hairy outside.

The fruit, of which only one specimen (in alcohol) belonging to *Bünnemeijer* n. 375 is extant, is the violet berry, typical for many species of the genus.

Argyreia nuda belongs to the group of species with a shallowly 5-lobed corolla. The dry corollas of n. 436 make the impression to be more deeply lobed; from an examination of materials preserved in alcohol it becomes evident, however, that these lobes are due to a rupture of the corolla limb.

The new *Argyreia* may be inserted in my key to the Malaysian species (*Blumea* V, no. 2, 1943, p. 356) in the following way:

- | | |
|--|------------------------|
| 4b. Sepals oblong, ovate or elliptic, obtuse, very rarely acutish, never patently hirsute | 5 |
| 5a. Sepals glabrous or very sparsely pilose | 5' |
| b. Sepals densely sericeous or tomentose | 6 |
| 5'a. Inner sepals cucullate. Corolla with hairy midpetaline bands outside | 7. <i>A. cucullata</i> |
| b. Inner sepals not cucullate. Corolla glabrous outside | <i>A. nuda</i> |
| 6a. etc. | |

THE CONVULVULACEAE OF MALAYSIA, V¹⁾

by

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(Rijksherbarium, Leiden)

(Issued December 31st, 1945)

Key to the genera.

(See the Index to the genera at the end of this key).

- 1a. Parasitic plants with filiform, twining stems, leafless or with minute pale scales. Flowers small, in clusters or short racemes; corolla mostly with 5 episepalous fimbriate scales inside (*Cuscutaeae* Hall. f.) **1. Cuscuta**
- b. Non-parasitic plants with green leaves 2
- 2a. Pollen spinulose (*Echinoconiae* Hall.f.) 18
- b. Pollen not spinulose (*Psiloconiae* Hall.f.) 3
- 3a. Ovary deeply 2-lobed; styles 2, inserted between the lobes (gynobasic). Flowers small, solitary in the leaf-axils. Corolla deeply 5-lobed. Small creeping herbs; leaves kidney-shaped or orbicular-cordate **2. Dichondra**
- b. Ovary not deeply 2-lobed, style not gynobasic 4
- 4a. Stigma 1, sessile, conical or semiglobular, 5—10-rayed. Corolla-lobes bifid. Ovary 1-celled. Fruit fleshy or woody, indehiscent. Woody climbers or erect shrubs **7. Erycibe**
- b. Style or styles present, well-developed 5
- 5a. Outer 3 or all of the sepals much enlarged in fruit, patent, scarious, reticulately nerved, falling off with the fruit. Flowers small, in racemes or panicles. Corolla limb subentire or lobed. Style 1, entire or bifid. Woody or herbaceous twiners **6. Porana**
- b. Sepals either enlarged in fruit or not so, remaining attached to the pedicel after the dehiscence of the fruit 6
- 6a. Styles 2, free or partly united below 7
- b. Style 1, entire, or with 2 very short branches, covered by the stigmas 9
- 7a. Styles 2, free 8

¹⁾ Part I in *Blumea* III, 1 (1938) p. 62—94; part II in *Blumea* III, 2 (1939) p. 267—371; part III in *Blumea* III, 3 (1940) p. 481—582; part IV in *Blumea* V, 2 (1943) p. 339—411.

- b. Styles partly united below; stigmas globular to peltate; ovary hairy. Flowers in pedunculate cymes in the leaf-axils. Midpetaline areas of corolla pilose outside. High climbers **4. Bonamia**
- 8a. Each of the 2 styles forked and with 2 filiform or slightly clavate stigmas. Corolla limb nearly entire. Bracts not accrescent in fruit. Small herbaceous plants, never twining **3. Evolvulus**
- b. Each of the 2 styles with a peltate, lobed and kidney-shaped stigma. Corolla limb deeply 5-lobed. Bracts much enlarged in fruit, scarious. Large woody climbers **5. Neuropeltis**
- 9a. Corolla limb entire or slightly lobed 10
- b. Corolla limb distinctly 5-lobed, the lobes bifid, the tube fleshy, \pm cylindrical. Inflorescences pedunculate, few-flowered. Stigmas globose **15. Decalobanthus**
- 10a. Sepals enclosed by two large bracts. Corolla campanulate to funnel-shaped with slightly lobed limb. Stigmas oblong or elliptic, complanate **11. Calystegia**
- b. Sepals not enclosed by bracts 11
- 11a. Hairs on stems and leaves stellate, with 3 or more rays. Flowers in axillary cymes. Corolla campanulate to funnel-shaped, with slightly lobed or subentire limb, blue, lilac, pink or rarely white. Stigmas elliptic or oblong, complanate, rarely linear or globose. Leaf base cordate or truncate, never hastate or sagittate **8. Jacquemontia**
- b. Hairs not stellate (or wanting) 12
- 12a. Outer sepals acute or acuminate, much longer and broader than the inner ones. Stems not alate 13
- b. Outer sepals not longer and broader than the inner ones and at the same time acute or acuminate 15
- 13a. Outer sepals decurrent on the pedicel. Corolla white. Ovary glabrous. Stigmas globular to oblong. Valves of capsule silvery white and shining inside. Leaves oblong, narrowed towards the base **9. Aniseia**
- b. Outer sepals not decurrent on the pedicel 14
- 14a. Corolla glabrous or nearly so, pale blue, lilac or white. Ovary glabrous. Stigmas elliptic or filiform. *See 8. Jacquemontia.*
- b. Midpetaline areas of corolla pilose outside. Corolla white or cream-coloured, with or without a purple centre. Ovary hairy. Stigmas ovate-oblong, complanate **12. Shutereia**
- 15a. Stigmas filiform or elliptic 16
- b. Stigmas globular 17
- 16a. Stigmas elliptic. Corolla pale blue or lilac. Leaf base truncate, rounded or slightly cordate. *See 8. Jacquemontia.*
- b. Stigmas filiform. Corolla white or pink. Leaf base mostly hastate or sagittate **10. Convolvulus**
- 17a. Capsule circumscissile; upper part of epicarp separating from lower part and from endocarp. Corolla white or pale yellow without purple centre. Stems terete or winged **14. Operculina**
- b. Capsule opening by 4 valves or more or less irregularly dehiscent.

- Corolla white, pale or bright yellow, sometimes with a purple centre.
 Stems not winged **13. Merremia**
- 18a. Corolla tubular, campanulate, funnel-shaped or salver-shaped 20
 b. Corolla broadly or narrowly urceolate, at the base narrowed or not narrowed into a short tube 19
- 19a. Corolla actinomorphic, urceolate, not narrowed at the base. Stamens shorter than corolla. Filaments dilated at their base into a concave scale, arched over the ovary **18. Lepistemon**
 b. Corolla \pm zygomorphic, narrowly urceolate, at the base narrowed into a short tube. Stamens longer than corolla. Filaments not dilated into a concave scale **17. Mina**
- 20a. Calyx in fruiting stage much enlarged, completely enclosing the ripe fruit. Leaf blades with minute black dots (glands) beneath **19. Stictocardia**
 b. Calyx enlarged or not enlarged in fruit, not completely enclosing the ripe fruit. Leaf blades without black dots beneath 21
- 21a. Fruit a thin-walled capsule opening by valves or irregularly dehiscent. Herbaceous or rarely woody twining or prostrate, rarely erect plants. Corolla mostly glabrous outside **16. Ipomoea**
 b. Fruit fleshy or leathery, often purple, red or yellowish, globose or ellipsoid. Woody twiners. Corolla outside mostly with hairy midpetaline areas **20. Argyreia**

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¹⁾ This genus will be treated in a special monograph.

ORCHIDACEAE NOVAE MALAYENSES XVIII *)

by

J. J. SMITH

(Oegstgeest).

(Issued December 31st, 1945)

Tropidia multiflora J. J. S. n. sp. — Fig. 1.

Planta parva. Caules erecti, tenues, basi tantum ramosi, basi radican-
tes. c. 23 cm longi, inferne vaginati, superne 3—4-foliati. Folia erecto-patentia,
lanceolata; acuminata, acutissima, basi acuta, nervis 5 majoribus sicco sub-
tus et etiam supra prominentibus pluribusque tenuibus, sicco membranacea,
ad c. 8—12 cm longa, 1.85—2.2 cm lata, ultimum multo angustius; vagina
elongata, tubulosa, prominenter nervosa. Inflorescentia terminalis; erecta,
simplex, densissime multiflora, quaquaversa, pedunculo c. 3 cm longo, inferne
vagina folii ultimi incluso, superne vaginula lineari c. 3 cm longa donato,
rachide c. 1.2 cm longa. Bractee valde approximatae, patentissimae vel
subpatentissimae, e basi triangula longe subulato-lineari-acuminatae, 5-
nerviae, ad c. 0.7 cm longae, basi dilatata fere 0.3 cm longa 0.25 cm lata,
superiores minores. Flores patentes, non resupinati, c. 0.75 cm longi,
sepalis petalisque divergentibus. Sepalum dorsale cum ovario angulum obtusum
faciens, incurvulum, oblongum, apicem versus angustatum, obtusum, concavum,
parte inferiore dorso parce patentissime puberulum, 3-nervium, c. 0.65 cm
longum, 0.225 cm latum. Sepala lateralibus marginibus anticis c. 1/3
longitudinis connata atque rotundato-saccata, divergentia, 2/5 partibus
superioribus recurvula, oblique oblonga, subsigmoidea, apice angustata,
acutiuscula, valde concava, dorso

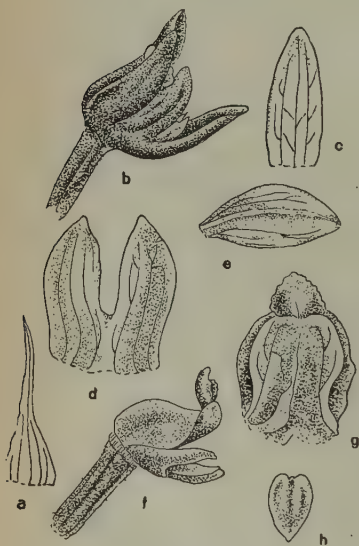


Fig. 1 — *Tropidia multiflora* J. J. S. n. sp. — a. bractea; b. flos; c. sepalum dorsale; d. sepala lateralibus; e. petalum; f. labellum et gynostemium; g. labellum explanatum; h. anthera — after type specimen.

*) XVII in Blumea V (1943), 297.

nonnullis pilis brevibus inspersa, 3-nervia, costa media dorso incrassata, c. 0.64 cm longa, 0.2 cm lata. Petala oblique elliptica, subfalcata, obtuscula, canaliculato-concava, 3-nervia, costa media dorso valde incrassata inter sepala prominente et pilis raris inspersa, c. 0.6 cm longa, 0.25 cm lata. Labellum cum ovario angulum obtusum faciens, gynostemio parallelum, valde concavum, $\frac{2}{5}$ partibus superioribus valde recurvum, apice incurvulum, subtus alte sulcatum, intus valde 3-costatum, costa intermedia in $\frac{1}{3}$ supra basin terminante, costis exterioribus intramarginalibus in bene $\frac{2}{3}$ supra basin arcuato-incurvis et terminantibus, inexplanatum c. 0.475 cm longum, explanatum ambitu quinquangulato-ovatum, infra medium utrinque leviter obtusangule dilatatum, apice in laminam triangulam obtusam crenulatam contractum, 3-nervium, totum fere 0.6 cm longum, fere 0.4 cm latum, lamina 0.15 cm longa, 0.175 cm lata. Gynostemium cum ovario angulum obtusum faciens, rectum, apicem versus paulum incrassatum, dorso convexum, c. 0.375 cm longum, clinandrio concavo, subquadrangulo cum costa longitudinali. Anthera conspicua, cucullata, cordata, acuta, lobulis basilari-bus brevissimis rotundatis, connectivo convexo-costiformi, fere 0.25 cm longa. Pollinia 2, clavata, sulcata, cum stipite longo lineari et glandula parva oblonga fere 0.3 cm longa. Rostellum porrectum, e basi lata acuminatum, acute bidentatum. Stigma margine inferiore semirobundatum productumque. Ovarium 6-sulcatum, pilis raris brevibus inspersum, c. 0.45 cm longum.

Soemba: In the eastern part, Maemaroë, in forest. (*Iboet* n. 425, 7 May 1925; "flowers white").

This species reminds one of *T. Reichenbachiana* Krzl. but the bracts are not unequal, the sepals and petals are not acuminate, the lateral sepals are connate to $\frac{1}{3}$ of their length, the petals are elliptic and the top of the lip is minutely crenulate.

Description from an apparently young dried specimen.

Dendrochilum (sect. *Platyclinis*) **muriculatum** (J. J. S.) J. J. S. n. comb. — *Basigyne muriculata* J. J. S. in Bull. Jard. Bot. Buit. 2e sér. XXV (1917) 5.

Celebes: G. Tolongan. (Exp. L. van Vuuren, Mantri Rachmat n. 1001, January 1914). Central Celebes, Mandar, G. Mamboeliling, north of Mamasa, above 2500 m, mountain-forest. (*C. Monod de Froideville* n. 111, 1938; L).

The genus *Basigyne* was based with some hesitation on a single, much pressed specimen, collected by Mantri Rachmat of the Botanic Gardens, Buitenzorg, during the expeditions of Prof. L. van Vuuren to Celebes. The species was redetected by Mr C. Monod de Froideville on Mt Mamboeliling, but it is to be pitied that no flowers in spirit were secured. However, the study of an allied species in the same collection in which the stigma is not situated at the base of the column, makes it probable that the genus *Basigyne* had better be abolished and united with *Dendrochilum* Bl.

Dendrochilum (sect. *Platyclinis*) **Monodii** J. J. S. n. spec. — Fig. 2.

Pseudobulbi approximati, sicco e basi anguste oblongo-ovoidea sensim attenuati, 2.3 cm longi, 1-folii, vaginis anguste tubulosis opacis haud vel obsolete punctatis ad 4.5 cm longis ad basin. Folium petiolatum, lanceolatum, sensim angustatum, acutum, basi in petiolum acuminatum acutum, sicco papyraceum, nervis 5 majoribus numerosisque minoribus sicco promi-

nulis, 7.4—7.8 cm longum, 1.5—1.6 cm latum; petiolus 2.7—3.2 cm longus. Inflorescentia in pseudobulbo submaturo, gracilis, folium longe superans, laxe multiflora, pedunculo filiformi c. 9.5 cm longo, rachide vix flexuosa angulata laxissime et brevissime muriculata 11 cm longa, internodiis 0.4—



Fig. 2 — *Dendrochilum Monodi* J. J. S. n. sp. — a. habitus $\times \frac{1}{2}$; b. bractea; c. sepalum dorsale; d. sepalum laterale; e. petalum; f. labellum et gynostemium; g. labellum expansum — after type specimen.

0.5 cm longis. Bractea patentissimae, marginibus involutis, expansae subovato-ovales, obtusae, 5-nerviae, 0.425 cm longae, 0.2 cm latae. Flores c. 21, patentissimi, macerati c. 0.5—0.675 cm diam., sepalis petalisque patentissimis. Sepalum dorsale anguste oblongum, subacutum, apice recurvum, 3-nervium, c. 0.5 cm longum, 0.1 cm latum. Sepala lateralibus oblique ovato-oblonga, brevissime acute acuminata, 3-nervia, c. 0.5 cm longa, 0.175 cm lata. Petala subobovato-oblonga, obtusa, basin versus sensim paulum angustata, 2—3-nervia, 0.45 cm longa, supra medium 0.175 cm, supra basin 0.125 cm lata. Labellum ad basin gynostemii insertum, cum gynostemio angulum acutum faciens, parte inferiore convexum, simplex, omnino integerrimum, glabrum, 3-nervium, callo orbiculari annulari antice interrupto (vel lamellis 2 longitudinalibus brevibus semiorbicularibus) ad basin, 0.45 cm longum, parte inferiore longitudine 0.175 cm paulum contractum hypochilium siccum convexum subquadratum angulis basalibus rotundatum 0.17 cm latum sensim in epichilium brevi-ovatum obtusum minutissime apiculatum 0.275 cm longum bene 0.2 cm latum dilatatum faciente. Gynostemium satis conspicuum, subrectum, labello brevius, late alatum, 0.34 cm longum, ala apice lata truncata 3-lobulata, lobulo intermedio lato truncato in lacinulas 8—9 subirregulares angustas subulatas ad triangulas parallelas partito, lobulis lateralibus vix longioribus porrectis integris rhomboideis obtusis. Pollinia 4, pyriformia. Stigma cupuliforme, circiter in medio gynostemii. Ovarium pedicellatum 0.3 cm longum.

Celebes: Central Celebes, Mandar, G. Mamboeling, above 2500 m, mountain-forest. (*C. Monodi* de Froideville n. 110, 1938; L).

Apparently this species is allied to *D. muriculatum* J. J. S., on which I based in 1917 the genus *Basigyne*. Other nearly related species are as yet unknown to me. It has the same habit, petioled and manifestly acuminate leaves, a loose, more or less muriculate inflorescence, a simple lip, and the column seemingly make part of the terminal wing. The new species differs from *D. muriculatum* in the longer, more-flowered, far less conspicuously muriculate inflorescence, smaller glabrous flowers with an at the base not hooded dorsal sepal, very different petals, a

the lateral wings of the column seemingly make part of the terminal wing. The new species differs from *D. muriculatum* in the longer, more-flowered, far less conspicuously muriculate inflorescence, smaller glabrous flowers with an at the base not hooded dorsal sepal, very different petals, a

broader lip, a much larger column with the middle portion of the apical wing much lacinulate, the stigma not situated at the base of the column but nearly halfway the top. It would be very desirable to study fresh or in alcohol preserved flowers.

Description from herbarium.

Microstylis (sect. *Crepidium*) **mambulingensis** J. J. S. n. sp. — Fig. 3.

Pusilla. Rhizoma decumbens, tenue, parte praesente 7 cm longa, pseudobulbo erecto, 1.75 cm longo, foliato. Folia c. 6, oblique lanceolata, subfalcatula, apicem versus sensim angustato-acuminata, apice plus minusve conduplicata, acuta, basi angustata canaliculata in vaginam abientia, cris-pula, nervis majoribus 3—5 tenuibus interpositis, costa media dorso carinata, sicco membranacea, majora 2.9—3.5 cm longa, 0.8—0.7 cm lata, vagina 1.3—1.5 cm longa, folium infimum minimum, 0.3 cm longum. Inflorescentia terminalis, erecta, laxe multiflora, folia bene superans, pedunculo anguste alato, 2.5 cm longo, rachide anguste alata 5.5 cm superante internodiis 0.25—0.4 cm longis. Bractee patentissimae, deinde subreflexae, lanceolato-subulatae, acutae, 1-nerviae, 0.36—0.4 cm longae. Flores c. 21, parvi. Sepalum dorsale ovato-oblongum, obtusum, convexum, 1-nervium, 0.25—0.275 cm longum, 0.125—bene 0.125 cm lata. Sepala divergentia, oblique ovato-ovalia, rotundata, convexa, margine valde recurva, 2-nervia, 0.18—0.2 cm longa, 0.15 cm lata. Petala linearia, marginibus recurvis dorso contiguus, obtusa, vix retusa, 1-nervia, 0.25—0.26 cm longa, 0.05—0.06 cm lata. Labellum hippocrepidiforme, breve, latum, in toto 0.25 cm, a loco insertionis 0.13 cm longum, 0.4 cm latum, lobulo intermedio minuto, aequilateraliter trapeziformi leviter retuso, 0.025 cm longo, utrinque laciniiis 5 subaequalibus lobulo bene longioribus subulatis plus minusve falcatulis usque 0.1 cm longis, lacinia exteriore paulo minore triangula, auriculis breviusculis oblique triangulis obtusis 0.08—0.1 cm longis basi c. 0.1 cm latis, foveae marginibus incrassatis. Gynostemium a dorso compressum, oblongo-quadrangulum, 0.13 cm longum, auriculis divergentibus deinde erecto-patentibus. Anthera reniformis, apice lata. Pollinia 4, in corpusecula 2 obcordato-ovatis unita. Ovarium pedicellatum 0.54 cm longum.

Celebes: Central Celebes, Mandar, G. Mamboeliling, 2700 m (C. Monod de Froideville n. 106, December 1937—April 1939; L).

This is an elegant little species which has many allies in the Malay Archipelago. In the shape of the flowers it much resembles *M. purpureo-viridis* J. J. S. from the Talaud Islands (*H. J. Lam* ns. 3239 and 2569) but it is a smaller plant with narrower leaves and

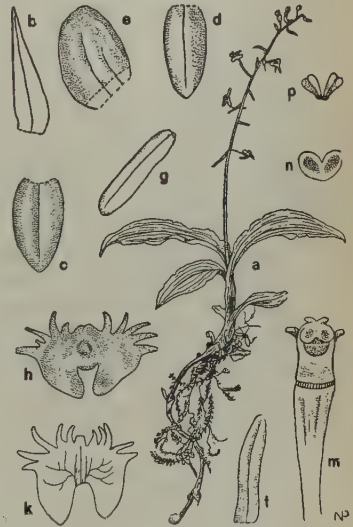


Fig. 3 — *Microstylis mambulingensis* J. J. S. n. sp. — a. habitus $\times \frac{1}{2}$; b. bractea; c, d. sepalum dorsalia; e. sepalum laterale; f, g. petala; h, k. labella; m. gynostemium; n. anthera; p. pollinarium — after type specimen.

smaller flowers with 5 teeth on either side of the smaller midlobe of the lip.

Description from a dried specimen.

Liparis (sect. *Rachidibulbon*) **Hagerupii** J. J. S. n. sp. — *Fig. 4.*

Rhizoma abbreviatum, innovationibus basi vaginis imbricantibus tectis. Folium solitarium, probabiliter ovatum, c. 8.5 cm longum, 5.5 cm latum; petiolus cum vagina c. 1.5 cm longus. Inflorescentia terminalis, laxe pluriflora, pedunculo alato, c. 5.5 cm longo basi in pseudobulbum incrassato, rachide c. 3.5 cm, fructifera 5 cm longa. Bractea triangulae, acutae, pedicello multo breviores. Flores patentes. Sepalum dorsale recurvum, lanceolatum, apicem versus sensim angustatum, obtusum, convexum, 3-nervium, c. 0.7 cm longum, fere 0.2 cm latum. Sepala lateralia sub labello

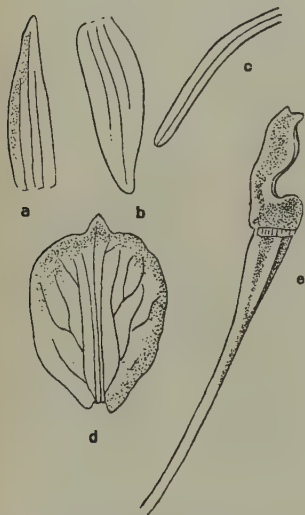


Fig. 4. — *Liparis Hagerupii* J. J. S. n. sp. — a. sepalum dorsale; b. sepalum laterale; c. petalum; d. label- lum expansum; e. gynostemium — after type specimen.

porrecta, parallela, oblique anguste oblonga, apicem versus angustata et leviter acuminata, obtusa, marginibus valde recurvis, 3-nervia, costa media dorso prominente, c. 0.65 cm longa, bene 0.2 cm lata. Petala arcuato-recurva, linearia, obtusa, valde convexa, 1-nervia, c. 0.64 cm longa, 0.08 cm lata. Labelium porrectum, basi gynostemio parallelum, recurvulum, leviter obtusangule canaliculatum cum lateribus leviter convexis, costa leviter convexa in canalicula, basi canaliculatum, dorso costa longitudinali convexo-prominente instructum, explanatum late obovatum, apice abrupte subtruncato-triangulo-productum, basi angustatum et auriculis 2 parvis obtusis donatum, nervis 3 valde approximatis, exterioribus ramosis, totum c. 0.72 cm longum, 0.54 cm latum. Gynostemium vix curvulum, in utraque stigmatis parte obtusangule alato-dilatatum, basi subtus valde calloso-incrassatum, c. 0.3 cm longum. Ovarium 6-angulatum, cum pedicello tenuiore 1 cm longum. Capsula pedicellata, erecta in valvas 6 lineares dehiscens.

Sumatra: Toba (*O. Hagerup* n. 47 p.p., 1916—'17).

A very near ally of *L. latibasis* J. J. S., and especially similar in the shape of the column. It differs in the obovate lip being shortly 2-auriculate at base, rotundate, not or hardly retuse at the top and with an imposite triangular, blunt terminal lobule.

The colour has not been noted.

Description from a single, damaged, dried specimen.

Bulbophyllum (sect. *Aphanobulbon*) **falculicorne** J. J. S. n. sp. —

Fig. 5.

Rhizoma elongatum, ramosum, teres, initio vaginis acuminatis tectum, parte praesente c. 6.5 cm longa, sicco 0.125 cm diam. Pseudobulbi remoti, parvi, rhizomati adpressi 0.14 cm longi, 1-folii. Folium petiolatum, lanceolatum, sensim angustatum, acutum, basi cuneata acutum, sicco rigidulum, tenuiter

coriaceum, 5—6.75 cm longum, 0.55—1 cm latum; petiolus distinctus, sulcatus, 0.2—0.55 cm longus. Inflorescentiae e nodis rhizomatis, folio bene breviores, laxae pauciflorae, 0.9—1.5 cm longae, pedunculo 0.5—0.8 cm longo nonnullis vaginulis sese amplectentibus adpressis acuminatis donato, rachide 0.5—0.6 cm longa, internodiis 0.2—0.25 cm longis. Bractee patentissimae vel plus minusve recurvae, ovato-lanceolatae, sensim acuminatae, concavae, sicco usque bene 0.3 cm longae. Flores 2—3, macerati c. 0.6 cm longi. Sepalum dorsale porrectum, anguste oblongum, conico-apiculatum, basi leviter contractum, concavum, 3-nervium, 0.55 cm longum, superne bene 0.15 cm, inferne bene 0.1 cm latum. Sepala lateralibus cum pede gynostemii mentum breve incurvum cum ovario angulum acutum faciens dorso convexum 0.2 cm longum formantia, oblique ovato-triangularia, acuta, subulato-apiculata, concava, 3-nervia, 0.56 cm longa, basi 0.275 cm, supra basin 0.3 cm lata. Petala parva, porrecta, lanceolato-linearibus, obtusiuscula, falcatula, convexa, bene dimidio superiore intus papilloso-puberula, parte inferiore glabra, 1-nervia, 0.225 cm longa, 0.04 cm lata. Labellum ungue brevissimo pedi gynostemii insertum, mobile, erectum, ante medium recurvum, versus apicem angustatum, obtusum, inferne lateribus erectis dilatatis canaliculatum, parte antica convexum, subtus concavum, maceratum fere 0.3 cm longum. Gynostemium brevissimum, auriculis porrectis, e basi dilatata subulato-acuminatis, pede cum ovario angulum acutum faciente, lineari, superne incurvo et a sepalis lateralibus libero, apice brevissime recurvo incurvoque, 0.15 cm longo, callo conspicuo conico recurvo ad basin infra stigma. Ovarium oblique obconicum, 0.175 cm longum; pedicellus tenuior, 0.075 cm longus.

Celebes: Central Celebes, Mandar, G. Mamboeliling, near Mamasa, 2700 m. (C. Monod de Froideville n. 108, December 1937—April 1939; L.).

To all appearance this specimen is a portion of a bigger plant, so that for the present it cannot be said whether the plant has a creeping or a pendulous habit. It shows some likeness with *B. perpendiculare* Schltr. and with *B. agapethoides* Schltr. The principal distinguishing characters are the rather small, petioled, lanceolate, acute leaves and the short, few-flowered inflorescences. In the narrow petals, for the greater part, except for the base, papillate-puberulous inside, it recalls to mind *B. auroreum* J. J. S. from Sumatra which for the rest is a quite different plant. The column-foot, which is much incurved in the upper part, bears at the base inside a conspicuous talon-shaped, recurved callus.

Description from a small dried portion of the plant.



Fig. 5 — *Bulbophyllum falculicorne* J. J. S. n. sp. — a. habitus $\times \frac{1}{2}$; b. flos; c. sepalum dorsale; d. sepalum laterale; e. petalum; f. labellum; g. gynostemium; h. anthera — after type specimen.

Microtatorchis (sect. *Eumicrotatorchis*) **Iboetii** J. J. S. n. sp. — Fig. 6.

Planta pumila, epiphytica, caule abbreviato, paucifolio, radicibus linearibus, compressis, 7—11 cm longis, 0.2—0.23 cm latis. Folia parva, erecta, carnosa, cuneato-oblongo-obovata, breviter acuminata, acuta, basin versus sensim angustata, dorso carinata, 1.1—1.7 cm longa, 0.4—0.45 cm lata. Inflorescentiae pedunculatae, distichae, laxe satis multiflorae, circiter 3.5 cm longae, diu flores gignentes, pedunculo anguste alato-angulato, 1.5 cm longo, rachide alato-angulata, c. 2 cm longa, internodiis 0.15—0.2 cm longis. Bracteae alternatim bifariae, subpatentissimae, late ovato-triangularae, acutae, carnosulae, c. 0.1 cm longae, appendicibus stipulaceis nullis. Flores c. 14, parvi, succedanei, carnosuli, 0.28 cm longi, sepalis petalisque inferne fere medium usque in tubum antice fissum connatis, 1-nerviis. Sepalum dorsale oblongum, obtusum, c. 0.2 cm longum, parte libera 0.14 cm longa, 0.07 cm lata. Sepala lateralia oblonga, obtusa, 0.2 cm longa, parte libera 0.14 cm longa. Petala quam sepala bene breviora, 0.15—0.16 cm longa, parte libera e basi contracta ovato-triangulara, subobtusa, 0.08 cm longa, 0.075 cm lata. Labellum 3-lobum, calcaratum, totum 0.18—0.2 cm, a loco insertionis 0.16 cm longum; lobi laterales ante gynostemium erecti, paralleli, trianguli, apice rectangulo acuti; lobus intermedius porrectus, cum labelli parte inferiore angulum obtusum faciens, carnosus, rectus, subteres, oblongus, obtusus; calcar reversum, supra basin incurvum, cum ovario angulum acutum faciens, breve, basi contractum, parte incurva inflata facie inferiore (antica) subplana ambitu rotundato-quadrangula elobata, apice rotundatum, fere 0.1 cm longum.

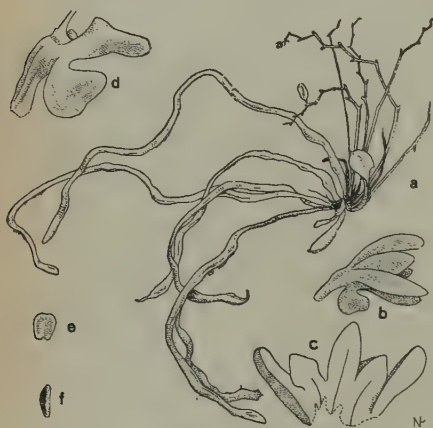


Fig. 6 — *Microtatorchis Iboetii* J. J. S. n. sp. — a. habitus $\times \frac{1}{2}$; b. flos; c. sepalae petalaeque explanatae; d. labellum et gynostemium; e. anthera; f. pollinium — after type specimen.

Gynostemium brevissimum, latum, 3-lobulatum, lobo intermedio (clinandrio) concavo, lobis lateralibus stigmaticis. Anthera minuta, cucullata, ovato-quadrangula, apice lato emarginata. Pollinia 2, oblonga. Ovarium crassiusculum, angulatum, cum pedicello subaequilongo paulo tenuiore 0.14 cm longum. Capsula immatura oblique oblonga, subcylindrica, angulata, apice incurvula, 0.5 cm longa, 0.26 cm diam., pedicello 0.13 cm longo.

Moluccas: Isle of Tidore, G. Mala-mala, 800 m, a few specimens epiphytic in old forest. (H. J. Lam n. 3686, 7 July 1926; "flowers light yellow, green when young, column light yellow, black tipped").

Amongst the species of section *Eumicrotatorchis*, *M. Iboetii* has several characters in common especially with *M. ceratostylis* Schltr. from New Guinea. It differs from the said species in the blunter sepals and lip, the much shorter petals, the subterete midlobe and the erect, triangular, at the top rectangular-acute side lobes of the lip. In *M. potamophila* Schltr.

from New Guinea the spur is also much incurved and the petals are much shorter than the sepals but the spur is much longer and the inflated top lobed, and the blade of the lip is very different.

The species has been named in remembrance of Mantri Iboet, the humble and devoted plant collector of the Buitenzorg Herbarium, who took part in several collecting expeditions in the Malay Archipelago and also accompanied Dr Lam on his journey to the Talaud Islands and Morotai.

Description from material preserved in alcohol.

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An asterisk denotes new species and new combinations. Synonyms in italics.

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LIST OF THE ORCHIDACEAE COLLECTED IN 1937
BY Dr C. G. G. J. VAN STEENIS IN ATJEH (NORTH SUMATRA) II¹⁾

by

J. J. SMITH

(Oegstgeest).

(Issued December 31st, 1945).

In Blumea V (1943), 316, I published a list of the Orchidaceae collected by Dr van Steenis in Atjeh. In this list a certain number of specimens were purposely omitted, on account of the fact that flowers had been preserved in alcohol, which material, however, was apparently not extant in Leiden. Under these conditions I have worked up the herbarium so far as possible from the dried specimens only.

Peristylus goodyeroides (D. Don) Lndl. Gen. et Sp. Orch. (1835), 299; etc.

Sumatra: Atjeh, above Takengon, 1250 m, open, stony, shortgrazed grassy slope. (C. G. G. J. van Steenis, n. 6023, August 1934; "flowers leather-yellow, very fragrant, leaves fleshy, glaucous green").

I suppose that the determination is correct, but there are no flowers on the single specimen.

Coelogyne (sect. *Longifoliae*) **vagans** Schltr. in Engl. Bot. Jahrb. XLV (1911), Beibl. No. 104, 5; etc.

Sumatra: Atjeh, Boer ni Telong, 1000 m, on lahar-rocks in *Pinus*-forest (C. G. G. J. van Steenis, n. 6127, August 1934; "flowers light greenish brown, glassy, lip light brown, column salmon-coloured"). 2000 m, lahar-rocks with low thin shrubs, very abundant on the rocks. (C. G. G. J. van Steenis n. 6363, September 1934; "bulbs golden yellow, flowers light brown, glassy?").

Coelogyne (sect. *Longifoliae*) spec.

Sumatra: Lampongs, G. Tanggamoës, 1900 m, summit (M. A. Lieftinck n. 33, December 1934—January 1935; salmon-coloured-brown with a somewhat purple hue").

No good flowers.

Dendrochilum (sect. *Eudendrochilum*) ? **complectens** J. J. S. in Bull. Jard. Bot. Buit. 3e sér. V (1922), 32; etc.

Sumatra: Atjeh, Boer ni Telong, 2000 m, open shrubs on lahar-rocks, immensely numerous, covering the slope with a thick layer. (C. G. G. J. van Steenis n. 6362, September 1934; "pseudobulbs orange, flowers greenish white").

Perhaps this species but the petals are distinctly longer clawed.

¹⁾ See Blumea V (1943), 316.

Dendrochilum (sect. *Platyclinis*) **simile** Bl. Bijdr. (1825), 400; Tab. fig. 51; etc.

Sumatra: Atjeh, above Takengon, 1275 m, epiphytical in wet forest. (C. G. G. J. van Steenis n. 5973, August 1934; "flowers pale yellowish").

Probably this species, but the material is bad.

Dendrochilum (sect. *Platyclinis*) **lineare** (Ridl.) Pfitz. et Krzl. in Pflanzenr. IV. 50. II. B. 7 (1907), 93, fig. 33, f, g. — *Platyclinis linearis* Ridl. in Journ. Linn. Soc. XXII (1903), 230. — *Acoridium lineare* Rolfe in Orch. Rev. XII (1904), 220.

Caespitosum, Rhizoma breve, valde ramosum, vaginis tubulosis acutis sicco dense prominenter nervosis opacis epunctatis superioribus majoribus pseudobulbos includentibus ad c. 7.5 cm longis, radicibus satis crassis initio pubescentibus. Pseudobulbi approximati, sicco subteretes rugulosique, 4—4.25 cm longi, ad 0.3 cm diam., 1-folii. Folium erectum, breviter petiolatum, lanceolato-lineare, breviter acute acuminatum, basi in petiolum angustatum, nervis majoribus 5—6 pluribusque tenuibus, praesertim costa media dorso prominente, firmiter papyracea, 16.5—21 cm longa, 0.65—0.95 cm lata, petiolo canaliculato sicco prominenter nervoso, 0.35—0.3 cm longo. Inflorescentiae in innovationibus nondum plane evolutis, erectae, folia superantes, multiflorae, pedunculo filiformi, 19—21 cm longo, rachide quadrangula anguste alata, 9—14 cm longa, internodiis 0.4—0.45 cm longis. Bracteae alternatim bifariae, patentes vel patentissimae, convolutae, triangulae vel suboblongae, obtusae, submembranaceo marginatae margine subirregulari, 3-nerviae, 0.43—0.45 cm longae, 0.2—0.175 cm latae. Flores 25—30. Sepalum dorsale rectum, lineari-subulatum, acutum, 3-nervi-um. 0.74 cm longum, 0.13 cm latum. Sepala lateralia superne recurva, lineari-subulata, acuta, 3-nervia, costa media incrassata, 0.7 cm longa, 0.14 cm lata. Petala lineari-subulata, acuta, apiculata, 3-nervia, 0.65 cm longa, 0.125 cm lata. Labellum ungue minuto apici pedis gynostemii elastice insertum, inexpansum gynostemio brevius, simplex vel subsimplex, 3-nervi-um, obtusum, margine erosulum, inferne marginibus erectis intus usque ad medium vel paulum ultra costis 2 longitudinalibus parallelis carnis donatum, apice arcte circinato-revolutum, a) inexpansum (maceratum) 0.175 cm longum, apice crasse carnosum haud bene expansibile, obtusum, expansum lineari-oblongum, parte supra unguiculum leviter dilatatum, 0.4 cm longum, 0.1 cm, supra basin 0.13 cm latum, b) apice arcte revolutum carnosum margine tenui, expansum lanceolatum, in 2/5 supra basin constrictum, omnino erosulum, 0.55 cm longum, constrictione 0.05 cm latum, hypochilio 0.2 cm longo 0.125 cm lato, epichilio apice angustato obtuso 0.30 cm longo 0.125 cm lato, c) apice revolutum non carnosum, expansum spatulato-lanceolatum, omnino erosulum, 0.5 cm longum, hypochilio (parte supra unguiculum 0.04 cm longum) oblongo 0.2 cm longo 0.1 cm lato, epichilio oblongo-ovato apice angustato obtuso 0.25 cm longo 0.13—0.14 cm lato. Gynostemium subgracile, curvulum 0.3—0.325 cm longum, ala apicali suggrundiformi concava bifida, lacinulis triangulis acutis sinu rotundato sejunctis, alis lateralibus alam apicalem fere aequantibus patentibus lanceolatis acuminatis, pede distincto sed brevissimo. Anthera cucullata, oblongo-cordata, apice leviter recurvula, obtusa, fere 0.1 cm longa, connectivo satis conspicuo gibboso oblongo

lateraliter compresso. Pollinia 4, pyriformia. Ovarium 6-sulcatum cum pedicello 0.2 cm longum.

Sumatra: Atjeh, Boer ni Telong, 1900 m, lahar-rocks. (*C. G. G. J. van Steenis* n. 6360, September 1934; "flowers greenish white"). Gajolanden, Poetjoek Angasan, 1500 m, forest-slope above Penosan, ridge, mountain-forest. (*C. G. G. J. van Steenis* n. 8279, February 1937). Atjeh. (Cult. in Hort. Bog. II M, f 75, February 1909).

Although I have not seen the type specimen I think that the present plant is Ridley's species collected on Kedah Peak.

At the bottom of his description Ridely says that in dried specimens the lip is coiled up at the end like a butterfly's tongue. This is also the case in the dried Sumatran material as well as in a living plant from Atjeh cultivated formerly in the Buitenzorg Botanic Garden.

Ridley does not mention that the midlobe is much thickened. However, in one of the examined flowers of *Van Steenis* n. 6360 the midlobe of the lip seemed not to be fleshy. It would be interesting to study a number of living plants in order to state whether there is perhaps a special cause for the thickening of the midlobe.

Description from *Van Steenis* n. 6360 only.

Liparis (sect. *Rachidibulbon*) sp.

Sumatra: Atjeh, slope of Boer ni Geredong, 1700 m, wet old forest. (*C. G. G. J. van Steenis* n. 6422, September 1934; "flowers dark wine-red").

No flowers seen.

Liparis (sect. *Cestichis*) **crenulata** (Bl.) Lndl. Gen. et Sp. Orch. (1830), 30; etc.

Sumatra: Atjeh, Boer ni Bias, 1300 m, forest, epiphytical. (*C. G. G. J. van Steenis* n. 6238, August 1934; "flowers dirty light greenish brown, lip dark salmon-coloured, column white").

Perhaps this species.

Ceratostylis (sect. *Pleuranthemum*) ? **tricallifera** J. J. S. in Bull. Jard. Bot. Buit. 3e sér. II (1920), 41; Suppl. II (1930), t. 35, II.

Sumatra: Atjeh, above Takengon, 1300 m, primeval forest. (*C. G. G. J. van Steenis* n. 6039, August 1934; "flowers leather-yellow, sepals with a brown erose tip"). Boer ni Lintang, 1800 m, moss-grown mountain forest, epiphytical. (*C. G. G. J. van Steenis* n. 6321, September 1934; "flowers light yellow").

Ceratostylis (sect. *Euceratostylis*) sp.

Sumatra: Atjeh, Laut Poepandji, 1900 m, forest-edge about rawa; epiphytical. (*C. G. G. J. van Steenis* n. 6408, September 1934).

No flowers.

Ceratostylis (sect. *Euceratostylis*) sp.

Sumatra: Atjeh, above Takengon, 1275 m, forest, epiphytical. (*C. G. G. J. van Steenis* n. 5960, August 1934; "nice, flowers white").

In many respects this resembles *C. leucantha* Schltr.

Appendicula (sect. *Euappendicula*) **podochiloides** J. J. S. n. sp.

Planta epiphytica, erecta vel patula, caulibus numerosis, fasciculatis simplicibus, approximatis, subteretibus, foliatis, ad 30 cm longis, sicco c. 0.2 cm diam., cum foliis 1.1—1.4 cm latis internodiis 0.25—0.5 cm longis, radicibus tenuibus villosis. Folia alternatim bifaria, articulata, sessilia, semiamplexicaulia, patentia, ovata, obtusa, breviter paulum inaequaliter obuse bilobula cum mucrone brevi interposito, convexa, costa media supra sulcata subtus versus apicem prominula, sicco crasse coriacea, rigida,

0.75—1 cm longa, 0.675 cm lata; vaginae tubulosae, apice truncatae, internodia aequantes. Inflorescentiae terminales et proprie apicem caulium axillares, breves, folia superantes, simplices vel postea basi parum ramosae, ramis simplicibus, strictae, dense multiflorae, basi sublaxiores, quaquaversae, 1.5—2 cm longae, pedunculo brevi, 0.2—0.3 cm longo, basi nonnullis vaginulis angustis foliaceis 0.3—0.5 cm longis instructo. Bractee persistentes, reflexae, concavae, triangulae vel ovato-triangulae, obtusiusculae vel acutiusculae, 3-nerviae, carnosulae, 0.22—0.28 cm longae, 0.13—0.15 cm latae. Flores 20 vel plures, quaquaversi, succedanei, parvi, macerati 0.775 cm longi. Sepalum dorsale late ovatum, acuminato-contractum, obtusum, concavum, apice canaliculatum, 3-nervium, 0.275 cm longum, 0.2 cm latum. Sepala lateralalia lacinia elongata concava ad pedem gynostemii decurrentia, mentum longum calcariforme leviter sigmoideum obtusum 0.45 cm longum formantia, 3-nervia, parte libera oblique oblonga, obtusa, 0.3 cm longa, 0.15 cm lata, basi 0.34 cm lata, lacinia decurrente 0.15 cm lata. Petala oblique ovata, apice subcontracta, obtusa, 3-nervia, 0.2—0.225 cm longa, 0.16—0.13 cm lata. Labellum basi apici pedis gynostemii adnatum, erectum, apice recurvulum, gynostemium superans, spatulatum, expansum 0.65 cm longum, ungue late lineari, versus basin palum dilatato, canaliculato, 0.4 cm longo, inferne bene 0.1 cm lato, lamina subovato-ovali, obtusa, c. 7-nervia, 0.27 cm longa, 0.17 cm lata, appendice basilari ungue bene brevior, margine libera, apice rotundata medio brevissime acuminata. Gynostemium breve, dorso convexum, usque ad apicem rostellii c. 0.2 cm longum, clinandrio excavato, pede elongato, lineari, subsigmoideo, 0.45 cm longo, apice c. 1/4 longitudinis labello adnato. Anthera cucullata, cordata, basi 4-lobulata, versus apicem sensim angustata, obtusa, minute 3-denticulata, denticulo intermedio laterales paululum superante, connectivo in parte inferiore rotundato-costato incrassato, 0.15 cm longa. Pollinia 6 (?), elongato-clavata, basi acuta, glandula 1 parva. Stigma transversum, alte excavatum. Rostellum porrectum, elongatum, lineari-triangulum, supra concavum, subtus convexum, 2-dentatum, bene 0.1 cm longum. Ovarium pedicellatum 0.475 cm longum.

Sumatra: Atjeh, above Takengon, 1300 m, primeval forest, epiphytic. (C. G. G. J. van Steenis n. 6035, August 1934; "flowers white, sepals tipped red, lower half of the lip red on the upper side").

For the present I have placed this interesting species in the genus *Appendicula* Bl., although I am not quite sure as to the number of pollinia. The 6 bodies which I have found in the anther of the examined flower bud, have quite the appearance of pollenmasses with an acute base. In habit the plant resembles more an *Appendicula* than a *Podochilus* but also in the latter genus there exist a few species which in the vegetative parts approach *Appendicula* (so *P. muricatus* (T. et B.) Schltr.

Good material is desirable in order to finally determine the status of the plant.

Description from dried specimens.

Calanthe (sect. *Eucalanthe*) **chrysoglossoides** J. J. S. in Bull. Dép. Agric. Ind. Néerl. XLIII (1910), 24; etc.

Sumatra: Atjeh, above Takengon, 1800 m, primeval forest. (C. G. G. J. van Steenis n. 6040, August 1934; "flowers pale rose").

The material lacks flowers, but it much looks like *C. chrysoglossoides* J. J. S. It had already been collected in Sumatra.

Calanthe (sect. *Eucalanthe*) sp.

Sumatra: Atjeh, Boer ni Geredong, 2100—2600 m, very common in mossy forest. (*C. G. G. J. van Steenis* n. 6512, September 1934; "flowers white, afterwards turning leather-yellow, lip with a yellow 2-ribbed callus at the base").

No good flowers.

Calanthe (sect. *Eucalanthe*) sp.

Sumatra: Atjeh, Boer ni Geredong, 2300 m, mossy forest on ridge, scattered. (*C. G. G. J. van Steenis* n. 6514, September 1934; "flowers beautifully purple-red like red cabbage").

No good flowers.

Calanthe gracilis Lndl. (1833), 251; Bot. Mag. LXXIX (1853), t. 4714; Griff. Not. III (1851), 367; Rehb. f. in Walp. Ann. VI (1862), 922; Hook. f. Fl. Br. Ind. V (1890), 855; Schltr. Orch. D. N. Guinea (1912), 391; Die Orch. (1915), 305; Ridl. Fl. Mal. Penins. IV (1924), 122 — *Limatodes gracilis* Lndl. Fol. Orch. (1854), 1.

var. **sumatrana** J. J. S. n. var.

Rhizoma repens, radicibus villosis. Caules eos *Plocoglottidis* sect. *Phyllocauli* in memoriam revocantes, c. 1.5 cm dissiti, erecti, c. 45 cm longi parte inferiore vaginis c. 5 magnis tubulosis inferioribus deinde in fibras tenues solutis ad 6—8 cm longis donati, superne foliati, internodiis 4.5—7.5 cm longis. Folia c. 6, erecti-patentia, lanceolata, apice sensim longe acuminata, acutissima, basi sensim angustata subpetiolato-contracta, subglabra, ut videtur subtus pilis minutis rarissime inspersa, inferne sicco longitudinaliter subplicata, nervis majoribus circiter 5—7 subtus prominentibus, sicco membranacea, 11.5—19.5 cm longa, 3—1.4 cm lata, parte petiolarum canaliculata foliorum inferiorum brevi lateque, foliorum superiorum longiore angustioreque; vaginae tubulosae, prominenter nervosae, usque ad 8.5 cm longae. Inflorescentiae 2, e nodis caulium, erectae, laxae multiflorae, brevissime puberulae, 17—25 cm longae, pedunculo 8.5—16 cm longo, basi paucis vaginis densis ceterum nonnullis vaginis laxioribus longioribus usque ad 3.5 cm longis donato, rachide 7.5—10 cm longa. Bractee caducae. Flores 9—16 parvi, quaquaversi, contusione ad colorem indicum (indigo) mutantes, sepalis dorso minute puberulis. Sepalum dorsale oblongo-triangularum, sensim longius acuminatum, concavum, margine anguste incurvum, 3—5-nervium, 0.825 cm longum, 0.35 cm latum. Sepala lateralia suboblique oblongo-elliptica, sensim longius acuminata, basi contracta, concava, margine anguste incurva, 3—5-nervia, 0.86 cm longa, 0.3 cm, basi 0.2 cm lata. Petala subelliptico-oblonga, breviter oblique acutata, basi angustata, glabra, 3-nervia, 0.73—0.77 cm longa, bene 0.25 cm, basi 0.1 cm lata. Labellum ecalcaratum, ungue brevi extus puberulo basi gynostemii faciei inferiori brevissime adnatum cavitatem humilem transversam faciens, 3-lobum, inter lobos laterales ventricosus-concavum extus cum sulco longitudinali, intus costis 2 conspicuis longitudinalibus in unguem lobi intermedi productis verrucosisque instructum, incrassatione humili convexa puberula inferne inter costas, expansum cuneatum 0.64—0.7 cm, usque ad apicem loborum lateralium 0.5—0.55 cm longum, ad lobos laterales 0.56—0.575 cm latum, lobi laterales oblique trianguli, obtusi, rotundati vel subtruncati, margine

antico irregulariter dentati; lobus intermedius breviter unguiculatus, 0.16 cm longus, ungue aequilateraliter trapeziformi, 0.07 cm longo, basi 0.15 cm, apice bene 0.1 cm lato, lamina abrupte dilatata transverse oblonga vel oblongo-quadrangula undulata, irregulariter dentato-lobulata, 0.1—0.15 cm longa, 0.3—0.33 cm lata. Gynostemium fere omnino a labello liberum, facie inferiore canaliculatum, marginibus basi rotundato-confluentibus cavitatem parvam formantibus, glabrum, fere 0.3 cm longum, clinandrio excavato; pariete postica breviter obtuse 3-lobulum. Anthera cucullata, subovato-orbicularis, apice rotundata, basi 2-gibboso-lobulata 0.1 cm diam. Pollinia 8, oblongo-ovata. Ovarium fecundatum fusiforme 6-sulcatum, patenter puberulum, fere 1 cm longum, cum pedicello tenuiore patenter puberulo 0.6 cm longo clavatum.

Sumatra: Atjeh, above Takengon, 1290 m, primeval forest. (C. G. G. J. van Steenis n. 6041, August 1934; "flowers white").

C. gracilis Lndl. or one of its forms was so far as I know not recorded from the Dutch East Indies until Dr van Steenis found it in the North of Sumatra. I think it adequate to distinguish the Sumatran form as a var. *sumatrana* and perhaps it will prove necessary to establish more varieties when more complete materials allow a successful study.

The type was described from specimens originating from British India and a fuller description and coloured plate appeared in the Bot. Mag. LXXIX (1853), t. 4714. According to these the Sumatran variety differs in the smaller, differently coloured flowers. Moreover the side-lobes of the lip are not entire but serrate in front. The blade of the midlobe is abruptly widened, transverse oblong-quadrangular, truncate, irregularly lobulate, undulate but apparently not so strongly as in the type.

Ridley states in his „Flora of the Malay Peninsula IV (1924), 122, that the flowers of the Indian specimens are usually yellowish green, whereas they are in the form of the Malay Peninsula white with a yellow lip. This form may belong to the Sumatran variety.

According to the descriptions and text cut of *Phajus halconensis* Ames (in Phil. Journ. Sc. 2, 1907, Bot. 323) and *Ph. calanthoides* Ames (Orch. 1908, 153, text cut) this plant is very similar to *Calanthe gracilis* Lndl. var. *sumatrana* J. J. S. and may be a form of same. Ames notes that the flowers are white turning yellowish. The whole small group of species or forms allied to *C. gracilis* Lndl. wants a critical revision from good material. At any rate the group should, I think, constitute a separate section.

C. gracilis Lndl. has variously been ascribed to the genera *Calanthe* R. Br. and *Phajus* Lour. and indeed the choice is not so very easy. I regret that I had not the opportunity to study flowers preserved in alcohol.

Description from dried specimens.

Phajus (sect. *Euphajus*) **callosus** (Bl.) Lndl. Gen. et Sp. Orch. (1831), 128; etc.

var. sumatranus J. J. S. in Bull. Jard. Bot. Buit. 3e sér. II (1920), 43.

Sumatra: Atjeh, slope of Boer ni Geredong, 1400—2100 m, wet old primary forest, common, in large clumps together. (C. G. G. J. van Steenis n. 6417, September 1934, "bud white, sepals and petals brownish yellow, outside white; lip much changing in colour, from purple-white to brownish yellow, with delicate longitudinal streaks and a yellow base, column white, foot marked wine-red").

Eria (sect. *Hymeneria*) sp.

Sumatra: Atjeh, Boer ni Lintang, 1800 m, wet mountain-forest (C. G. G. J. van Steenis n. 6322, September 1934; "spindle of inflorescence red, bracts yellowish green, flowers light yellow, column brimstone-yellow").

No flowers.

Eria (sect. *Aeridostachya*) ? **robusta** (Bl.) Lndl. Gen. et Sp. Orch. (1830), 69; etc.

? var. **pilosipetala** J. J. S. in Bull. Jard. Bot. Buit. 3e sér. XII (1932), 124.

Sumatra: Atjeh, Boer ni Telong, 2000 m, on lahar-rocks in thin shrubs, scattered. (C. G. G. J. van Steenis n. 6366, September 1934; "inflorescence dark brown").

Eria (sect. *Mycaranthes*) **obliterata** (Bl.) Rehb.f. in Bonpl. V (1857), 55; etc.

Sumatra: Atjeh, Boer ni Telong, 2000 m, on lahar-rocks with thin shrubs, common. (C. G. G. J. van Steenis n. 6365, September 1934, "plant yellowish, flowers yellow, lip red speckled").

Eria (sect. *Mycaranthes*) **schistoloba** Schltr. in Engl. Bot. Jahrb. XLIV (1911), Beibl. Nr. 104, 38; etc.

Sumatra: Atjeh, Boer ni Telong, 2000 m, on lahar-rocks with thin shrubs, common. (C. G. G. J. van Steenis n. 6364, September 1934; "inflorescences and flowers yellow").

Eria (sect. *Cylindrolobus*) **cyrtosepala** Schltr. in Engl. Bot. Jahrb. XLV (1911), Beibl. Nr. 104, 37; etc.

Sumatra: Atjeh, Boer ni Telong, 1900 m, on lahar-rocks. (C. G. G. J. van Steenis n. 6358, September 1934; "flowers white with longitudinal red streaks inside and outside").

Eria (sect. *Cylindrolobus*) **fimbriloba** J. J. S. n. sp.

Rhizoma repens, vaginatum, radicibus numerosis densissime grossius villosis. Caules approximati, cum rhizomate angulos acutos facientes, simplices, ut videtur subclavati, satis tenues, teretes, parte superiore interdum leviter serpentine vel flexuosi superne 3—5-folii, 16.5—21.5 cm longi, pro majorem partem vaginis tubulosis sicco membranaceis acutis internodiis brevioribus ad longioribus, parte foliata 2.5—4 cm longa, internodiis 2—4 cm longis infimis ultimisque brevioribus. Folia articulata erecto-patentia ad patentia, oblique acuta, basi plus minusve petiolato-contracta canaliculataque, cum caule sicco verrucis inspersa, costa media dorso prominente, tenuisculae coriacea, 7.6—6 cm longa, 0.6—0.85 cm lata, vaginis brevibus. Inflorescentiae in parte superiore caulium positae, brevissimae, c. 2-florae, glabrae, pedunculo cum rachide 0.5—0.7 cm longo, internodiis 0.275—0.35 cm longis. Bractee conspicuae, ovatae, acutae, glabrae, carnosulae, 0.85 cm longae, 0.43 cm latae. Sepalum dorsale lanceolatum, apice sensim subacuminatum, obtusum apice dorso leviter incrassatum, 3-nervium, 0.9 cm longum, 0.275 cm latum. Sepala lateralibus ad pedem gynostemii decurrentia, mentum breve obtusum facientia, falcata, oblique oblongo-triangularia, versus apicem angustata, obtusa vel obtusiuscula, 3(—4)-nervia, 0.6—0.7 cm longa, basi 0.4—0.375 cm lata. Petala oblique lineari-lanceolata, acuta, leviter falcata, 3-nervia, 0.67—0.76 cm longa, 0.15—0.175 cm lata. Labellum apice pedis gynostemii insertum, erectum, recurvum, 3-nervium, 3-costatum, 3-lobum, costis exterioribus conspicuis integris basi tenui apicem versus valde lamelliformi-

elevatis in c. 2/3 supra basin altissimis apicem versus decreescentibus infra apicem terminantibus, costa tertia interposita multo minore in lobo medio costato-elevata, expansum c. 0.425—0.45 cm longum, ad lobos laterales 0.26 cm latum; lobi laterales lati, apice haud producti, ambitu angulato-subsemiorbiculares, integerrimi, intus papilloso; lobus intermedius sinubus levibus latis a lobis lateralibus separatus (vel breviter lateque aequilatera- lriter trapeziformi-unguiculatus), ungue c. 0.05 cm longo, lamina sub-orbiculari vel plus minusve transverse ovali apice obtusangulo excepto filiformi-fimbriata, 0.2 cm lata. Gynostemium oblique conicum, cum anthera 0.24 cm longum, clinandrio contracto excavato lateribus triangulis vel potius oblique quadrangulis oblique truncatis, pede cum gynostemio ovarioque angulos obtusos faciente, leviter incurvo lineari-oblongo truncato 0.23 cm longo. Anthera plane cucullata, suborbicularis, apice 2-lobulata, connectivo incrassato apice inter lobulos dentiformi-producto, fere 0.1 cm lata. Pollinia 8. Stigma alte excavatum, longitudinale. Ovarium 6-suleatum, 0.45 cm longum.

Sumatra: Atjeh, Boer ni Telong, 1900 m, on lahar-rocks. (C. G. G. J. van Steenis n. 6359, type, September 1934, "plant yellowish green, flowers glassy white").

Geographical distribution: Endemic.

According to the description this species in some respects recalls to mind *E. leucantha* Ridl. It is, however, a smaller plant, measuring 16—25 cm in all, the internodes 2—4 cm. The linear-lanceolate leaves are 6—7.5 cm long and 0.6—0.85 cm wide. The very short inflorescences are usually 2-flowered. The ovary (pedicel) measures 0.45 cm, whereas in *E. leucantha* Ridl. it is 1.5 cm long. The white flowers are considerably smaller than in *E. leucantha* and the petals are linear-lanceolate and acute in the new species, obovate with a rounded tip in *E. leucantha*. The lip is quite differently shaped in the two species.

From all other species of the section *Cylindrolobus*, *E. fimbrioloba* is distinguishable by the fimbriate midlobe of the lip, but the material was not good enough to get a clear idea of the nature of the fringe.

Description from herbarium.

Dendrobium (sect. *Desmotrichum*) sp.

Sumatra: Atjeh, Boer ni Lintang, 1800 m, wet mountain-forest, epiphytical. (C. G. G. J. van Steenis n. 6320, September 1934; "flowers pale yellow").

No flowers.

Thrixspermum (sect. *Orsidice*) sp.

Sumatra: Atjeh, above Takengon, 1225 m, on rocks along grassy slope. (C. G. J. van Steenis n. 6034, August 1934; "flowers white, sepals and petals brimstone-yellow towards the top").

Good flowers necessary.

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COMPLEMENTARY AND EMENDATORY DESCRIPTIONS OF ORCHID SPECIES

by

J. J. SMITH

(Oegstgeest).

(Issued December 31st, 1945)

Neuwiedia (sect. *Euneuwiedia*) **Griffithii** Rehb.f. *Xenia* Orch. II (1874), 215; Rolfe in Journ. Linn. Soc. XXV (1890), 235, 241, t. XLVIII, fig. 2—9; in Orch. Rev. II (1894), 276; IV (1896), 329; Hook.f. Fl. Br. Ind. VI (1890), 176; in Bot. Mag. CXXI (1895), t. 7425; Krzl. Orch. I (1897), 4; Pfitz. in Pflanzenr. IV. 50 (1903), 5; Ridl. in Journ. Linn. Soc. XXXII (1896), 416; Mat. Fl. Mal. Penins. I (1907), 231; Fl. Mal. Penins. IV (1924), 296.

Planta in genere parva. Caulis erectus, rigidus, teres, dilute viridis, c. 14 cm longus, 0.63 cm diam., c. 10-folius. Folia erecto-patentia, recurva, lanceolata, sensim longe et acutissime acuminata, basi acuta sensim in petiolum contracta, plicata, nervis c. 7 subtus prominentibus, nervis tenuioribus alternantibus, papyracea, utrinque nitidule viridia, c. 18.5—22 cm longa, 4—5 cm lata, summa minora; petiolus latus, canaliculatus, 3-costatus, cum vagina tubulosa antice basi excepta rumpente c. 5.5—6.5 cm longus. Inflorescentia erecta, foliis multo brevior, subdense multiflora, cylindrica, pedunculo hirtello, atroviridi, c. 4 cm longo, nonnullis vaginulis in bracteis vergentibus donato, rachide angulato-cylindrica, patentissime hirtella, atroviridi, c. 6.5 cm longa. Bractee patentes, incurvulae, e basi ovata sensim longe subulato-acuminatae, anguste obtusae, basi rachidem semiamplectentes, praesertim basi concavae, dorso et margine hirtellae, 3-nerviae, virides, ad c. 1.4 cm longae, superiores minores. Flores quaquaversi, parvuli, patentes, nutantes, sepalis dorso patentissime superne patenter strigillosis petalisque conniventibus, concavis, tenuibus, albis, pallide flavescenti-apiculatis. Sepalum dorsale ellipticum, apiculo tereti strigilloso, valde concavum, totum c. 0.83 cm longum, apiculo 0.05 cm, 0.4 cm latum. Sepala lateralia oblique ovato-elliptica, apice cucullato-obtusa cum apiculo recto tereti-subulato strigilloso 0.08 cm longo, concava, costa media dorso convexo-incrassata, tota c. 0.87 cm longa, 0.375 cm lata. Petala late elliptico-obovata, obtusa, apice vix cucullata, basi margine antico vix unguiculato-contracta, concava, costa media dorso valde incrassata strigosaque apice in apiculum brevem producta in prae-floratione inter sepala prominente, c. 0.8 cm longa, 0.525 cm lata. Labellum a gynostemio subrectangule patens et recurvulum, supra basin obtusangule incurvum, stigma paululum superans, valde concavum, explanatum cuneato-angulato-obovatum, apice cucullato-obtusissimum, ungue

cuneato excepto leviter crispulum et erosulum, basi intus valde convexo-incrassatum, costa media dorso valde prominente et strigosa apice in apiculum incurvulum teretem hirtellum producta, fere 0.8 cm longum, mucrone 0.05 cm longo, 0.6 cm latum. Gynostemium totum c. 0.62 cm, usque ad apicem antherarum 0.4 cm longum. Stamina 3, glabra, inferne cum stylo in columnam rotundato-trigonam supra subtusque 2-sulcatum, c. 0.13 cm longam connata, superne divergentia, filamenti dorsalis pars libera a dorso compressa, oblonga, vix flavescenti-alba, c. 0.1 cm longa; filamentorum lateralium pars libera dorsali similis, 0.13 cm longa; antherae conniventes, fere basifixae, introrsae, praesertim dorsalis valde incurvae, cordatae, apicem versus paululum angustatae, late obtusae, lobis basilaribus obtusis, dorso valde convexae cum sulco levi longitudinali, crassae, vix flavescenti-albae, dorsalis fere c. 2 cm longa, 0.14 cm lata, laterales bene 0.2 cm longae, 0.175 cm latae. Stylus undatus, teres, leviter clavatus, apice (stigmati) obtusus et papillosus, albus, basi dilute sulphureus, totus c. 0.6 cm, parte libera 0.525 cm longus. Ovarium pedicellatum curvulum, rotundato-trigonum, patentissime strigillosum, pedicello apicem versus incrassato, pallide viridi, c. 0.33 cm longo, ovario trigono-ellipsoideo, viridi, c. 0.4 cm longo, fere 0.3 cm diam., apice in rostrum apice obliquum pallide viride dorso c. 0.275 cm longum contractum.

Sumatra: East coast, Deli, Habako estate, c. 150 m, in forest (*W. M. Docters van Leeuwen n. 3268*, fr., February 1919; also liv. pl. cult. in *Hort. Bog. XII B, II, 36*).

This agrees fairly well with the plate in *Bot. Mag. l.c.*, only the details appear to be kept somewhat schematic. The anthers of the few flowers I have seen were very much curved.

Description from a cultivated plant in Buitenzorg.

Galeola (sect. *Cyrtosia*) **Lindleyana** Rehb.f. *Xenia* Orch. II (1862), 78; Hook.f. *Fl. Br. Ind.* VI (1894), 88; King and Pantl. in *Ann. Calc.* VIII (1898), 204, t. 352; Ridl. in *Journ. Mal. Br. R. As. Soc.* LXXXVII (1923), 97. — *Cyrtosia Lindleyana* Hook.f. et Thoms. in *Ill. Himal. pl. t. 22*. — *Erythrorchis Lindleyana* Rehb.f. in *Bonpl. V* (1857), 37.

Rhizoma validum, lignosum, c. 0.8—1.8 cm diam., brevinode, vaginis magnis triangulis sicco crasse coriaceis c. 1—4 cm longis, radicibus crassiusculis. Inflorescentiae (caules) sine radicibus, erectae, validae, pedunculo stricto, simplici, tomentoso, c. 1.3 m alto, inferne 1.5 cm diam., vaginulis c. 10 mox fatiscentibus donato, rachide stricta, lanato-tomentosa, ad c. 36 cm longa, ramos brevissimos ad c. 3.5 cm longos c. 10-floros basi bractea conspicua suborbiculari acuminata tomentosa valde concava ad c. 2 cm longa suffultos emittente. Bractee adpressae, valde concavae, apice cucullatae, acutae, dorso subtomentosae, ad c. 2.5 cm longae, 1.85 cm latae. Flores mediocres, quaquaversi, asymmetrici, c. 2.5 cm diam., sepalis carnosulis dorso lanato-tomentosis. Sepalum dorsale ellipticum, apice marginibus incurvis breviter obtuse contractum, concavum, 5-nervium, intus inter nervos convexum, nervis intus canaliculatis dorso valde costato-incrassatis, costis basin non attingentibus intermedia excepta basi costula transversa geminato-conjunctis, c. 1.6 cm longum, fere 0.9 cm latum. Sepala lateralalia intermedio subsimilia sed obliqua, dextrum magis concavum, nervis intus magis insculptis costa media dorso valde carnosio-aliformi basi costis 2 posticis et 3 anticis conjunctis, c. 1.75 cm longum,

0.97 cm latum, laevum, nervis intus valde minus insculptis, bene 1 cm latum. Petala oblique ovata, apice marginibus incurvis breviter obtuse contracta, basi angusta, eroso-denticulata, glabra, 7-nervia, costa media dorso sulcata, c. 1.7 cm longa, 1.13 cm lata. Labellum porrectum, valde cucullato-concavum, gynostemium amplexans, undulatum, dorso sulco longitudinali conspicuo instructum, explanatum semiovale, rotundatum, basi truncatum medio tantum affixum, angulis basilaribus angulato-rotundatis, apice excepto eroso-lacinulatum, basi excepta intus papillis muriciformibus dense vestitum, papillis in medio labelli et apicem versus tenuioribus densioribusque, versus marginem laxioribus, squama reversa brevi aequilateraliter trapeziformi truncata supra basin, c. 1.8 cm longum, 1.65 cm latum. Gynostemium parvum, curvatum, clavatum, apice valde dilatatum, dorso ad apicem 3-costatum verrucosumque, appendicibus 2 porrectis carnosius muricibus subulatis donatis antice ad basin, cum anthera c. 0.7 cm longum, clinandrio transverso lato. Anthera cucullata, valde curvata, basi ultra locum insertionis producta et quadrilobulata, supra visa quadrangula, apice excisa, dorso muricibus conico-subulatis erectis vestita, c. 0.37 cm lata. Rostellum late rotundatum. Stigma clinandrio simile sed latius, margine inferiore producto late rotundato retuso. Ovarium curvatum, crassum, dense longe subadpresso villosum, c. 1.7 cm longum. Capsula conspicua, reflexa, fusiformis, apice rostrato-contracta, basi breviter petiolato-contracta, dehiscens, lanato-tomentosa, intus fusciscenti-argenteo-nitida et tenuiter transverse striolata, c. 13 cm longa, 2—2.2 cm diam. Semina alata, globosa, nitide fusco-nigra, ala irregulari elliptica praesertim apice lacinulata basi stipitato-contracta plus minusve spathulata dilute fusciscente c. 0.35—0.4 cm longa.

India: Sikkim Himalaya, 1300—2300 m. † Khassia Hills, 1300 m. Naga Hills.

Sumatra: Atjeh, Gajolanden, from Sanger, bivouac 2, to bivouac 3 on the confluence of K. Kapi and K. Aoenan, 1100 m, humid primeval forest. (C. G. G. J. van Steenis n. 9881, March 1937). East coast, Karolanden, Berastagi. (H. N. Ridley 1921). Petani valley, c. 1300 m, moist grassy grounds, rare. (J. A. Lörzing n. 8509, September 1921). Deli, above Bandarbaroe, c. 1300 m. (W. M. Docters van Leeuwen n. 7790, February 1924). Sibajak road, 1000 m. (A. Frey-Wyssling n. 194).

Description from Sumatran specimens, the flowers of which were partly preserved in alcohol.

Hetaeria abbreviata Lndl. Gen. et Sp. Orch. (1840), 491 (*Etaeria*). — *Etaeria lanceolata* Rehb.f. in Transact. Linn. Soc. XXX, 142. — *Dossinia lanceolata* Lndl. in Journ. Linn. Soc. III (1859), 186. — *Zeuxine abbreviata* Hook.f. Fl. Br. Ind. VI (1890), 109; Ic. plant. XXII (1894), t. 2178.

Caulis e basi decumbente radicante erectus, c. 10—17 cm longus, c. 4-folius. Folia oblique oblango-ovata, acuta, apiculata, 3-nervia, nervo medio supra albo, c. 3.2—6.5 cm longa, 1.3—2.3 cm lata; petiolus cum vagina tubulosa c. 1.2—2.7 cm longus. Inflorescentia erecta, laxa pluriflora, quaquaversa, pedunculo puberulo, c. 9.5 longo, nonnullis vaginulis tubulosis acuminatis pubescentibus donato, rachide pubescenti, c. 6 cm longa. Bracteae adpressae, ovatae, acute acuminatae, concavae, dorso laxe pubescentes, ciliatae, 1-nerviae, c. 0.7 cm longae, 0.37 cm latae. Sepalum dorsale ovatum, acuminatum, obtusum, concavum, 1-nervium, c. 0.43 cm longum, 0.3 cm latum. Sepala lateralia oblique ovata, acuminata, obtusiuscula, concava, dorso carinata, 1-nervia, c. 0.47 cm longa, 0.3 cm lata.

Petala sepalo dorsali agglutinata, late valde oblique elliptica, inaequilatera, acuta, basi angusta, 1-nervia, c. 0.45 cm longa, 0.3 cm lata. Labellum basi saccata sepalis lateralibus amplexum marginibusque gynostemio adpressum, 3-lobum, totum explanatum c. 0.625 cm longum, ad lobos laterales 0.35 cm latum, hypochilio valde concavo, costis 2 longitudinalibus valde approximatis cohaerentibus e basi tenui superne altissimis rotundatisque et utrinque supra basin appendice corniculata clavata obtusa curvula donato, lobis lateralibus erectis brevibus rotundatis concavis, lobo intermedio bifido, basi marginibus abrupte inflexis contiguisque breviuscule unguiculato, c. 0.36 cm longo, laciniis divergentibus anguste triangulis anguste obtusiusculis. Gynostemium breve, crassum, dorso valde convexum, subtus lamellis 2 longitudinalibus parallelis brevibus rotundato-obtusangulo-triangulis munitum, c. 0.23 cm longum. Anthera cucullata, brevis, cordata, acuta, apiculata, bene 0.2 cm longa. Ovarium c. 1 cm longum.

Sumatra: Gajo Loeës, Boerni Agoetan. (Exp. G. C. E. van Daalen, R. Pringgo Atmodjo n. 361, June 1904). Bataklanden, Dolok Singgalang, north of Toba lake, 700 m, rather rare. (J. A. Lörzing n. 8876, May 1922).

India: Nepal. (Wallich). Khasia Hills, 1300—1700 m. (J. D. Hooker and Th. Thomson).

I have cited this plant in my Enumeration of the Orchidaceae of Sumatra and neighbouring islands (in Fedde Rep. XXXII (1933), 149) under the above name. Comparison with the type specimen should decide whether the identification is correct. The callosities of the lip show some differences with Hooker's figure cited above.

H. bantaengensis J. J. S. from South Celebes much resembles this species.

Description from herbarium.

Hetaeria grandiflora Ridl. in Journ. Mal. Br. R. As. Soc. LXXXVII (1923), 98; J. J. S. Ic. Orch. Mal. I (1930), t. 10, I.

Caulis e basi decumbente erectus, c. 5.5 cm altus, 4—5-folius. Folia tempore florescentiae fatiscientia, oblique lanceolata, vix acuminata, acuta, basi brevissime acuminata, nervis majoribus 4 subtus prominentibus, reticulato-venosa, c. 7 cm longa, 1.9 cm lata; petiolus canaliculatus, c. 1.4 cm longus, vagina tubulosa, c. 1.8 cm longa. Inflorescentia erecta, laxe multiflora, pedunculo longe piloso, c. 13.5 cm longo, vaginulis 2 tubulosis acuminatis inferiore glabra 1.45 cm longa, superiore parce pubescenti minore donato, rachide longe pilosa, 10 cm longa. Bractee laxae adpressae, e basi lata concava dorso pubescenti ciliata acute triangulo-acuminatae, c. 0.7 cm longae, 0.45 cm latae. Flores non resupinati, c. 0.6 cm longi, sepalis petalisque conniventibus. Sepalum dorsale cum ovario angulum acutum faciens, oblongo-triangulum, obtusum, concavum, basi dorso longe pilosum, c. 0.55 cm longum, 0.275 cm latum. Sepala lateralia parallela, oblique ovalia, obtusa, concava, dorso longe pubescentia, 3-nervia, tota c. 0.67 cm longa, 0.325 cm lata. Petala sepalo dorsali agglutinata, leviter oblique linearia, recta, apice oblique rotundata, 1-nervia, c. 0.57 cm longa, apice 0.1 cm lata. Labellum superum, inexplanatum 0.575 cm longum, parte inferiore valde concavum, ambitu oblongo-ovatum, marginibus inferne gynostemio adnatis medio dentem rectangulum formantibus ante gynostemium incurvis contiguisque, antice utroque latere longitudinaliter papilloso-pulvinatum, subtus longitudinaliter sulcatum,

intus longitudinaliter costatum et basi utrinque lamellis 2 erectis parallelis longitudinalibus subquadratis apice minute irregulariter dentatis instructum, lamina conspicua, valde transverse dilatata, divaricato-biloba, apice obtusangule excisa, explanata c. 0.625 cm lata, lobis valde reflexis, oblique subobovato-ovalibus, rotundatis, basi canalicula longitudinali separatis, valde convexis, c. 0.32 cm longis, 0.225—0.25 cm latis. Gynostemium cum ovario angulum acutum faciens, superne utrinque alato-dilatatum, alis in dentem exeuntibus, subtus costis 2 longitudinalibus antice altioribus et infra stigmata in dentem triangulum terminantibus instructum, c. 0.475 cm longum, clinandrio alte excavato tenuiter membranaceo. Anthera basi in clinandrium immersa, e basi ambitu suborbiculari postice 4-lobulata in rostrum conspicuum oblongo-triangulum praesertim apice recurvulum producta, c. 0.3 cm longa. Rostellum porrectum, antheram subaequans, in lacinias lanceolatas subtortas medio obtusangule recurvas partitum. Stigmata 2, ad basin rostellii, transversa, plus minusve confluentia. Ovarium patens, recurvum, 6-sulcatum, longe reverse pilosum, c. 0.87 cm longum.

Sumatra: Karo-landen, Deleng Koetoe near Raja, 1425 m, in forest, rather rare. (*J. A. Lörzing* n. 7102, January 1920; "sepals and petals green with white tips, tinged with brown, lip white"; n. 4928, March 1917; "flowers dirty white with a little brown"). Berastagi, way to Sebakjak, hill woods. (*H. N. Ridley*; "sepals dull red, petals pink, lip white"; 1800 m, *W. M. Docters van Leeuwen* n. 7781, February 1924; "flowers brown and white"). Gajo-landen, from bivouac Halfweg to bivouac Aer Poetih falls, 1000 m, forest ridge. (*C. G. J. van Steenis* n. 9198, February 1937).

Geographical distribution: Endemic.

This species resembles *Zeuxine* in the very broad lamina of the lip. For the rest it is a typical *Hetaeria*, allied to *H. lamellata* Bl.

H. rotundiloba J. J. S. from North Celebes is very similar and more material should be compared.

Description from herbarium (*J. A. Lörzing* n. 7102).

Vrydagzynea bractescens Ridl. in Kew Bull. 1926, 87; J. J. S. Ic. Orch. Mal. inedit. t. 147, III.

Caulis e basi decumbente radicante adscendens, parte erecta c. 3.75—7 cm longa, 6—7-folia. Folia patentia, oblique subovata, acutata, acuta vel subacuminata vel obtusiuscula, apiculata, basi brevissime in petiolum contracta vel leviter cuneata, 3-nervia, costa media dorso prominente, sicco membranacea, c. 1.7—3.8 cm longa, 0.9—1.9 cm lata; petiolus canaliculatus cum vagina tubulosa 0.5—1.3 cm longus. Inflorescentia erecta, dense pluriflora, pedunculo c. 4.2—6 cm longo, vaginulis 2 foliaceis in bracteas vergentibus donato, rachide brevi, pubescenti, c. 0.8—1.1 cm longa. Bracteae lanceolatae, acutatae, leviter acuminatae, acutae, 1-nerviae, ovarium superantes, c. 0.7 cm longae, 0.2 cm latae. Flores c. 7—8, macerati c. 0.65 cm longi, sepalis conniventibus. Sepalum dorsale oblongum, dimidio superiore leviter contractum, obtusum, apice incrassatum, 1-nervium, c. 0.43 cm longum, 0.14 cm latum. Sepala lateralia oblique oblonga, apicem versus angustata, apice incrassata, obtusa, basi oblique dilatata et calcarari adpressa, concava, 1-nervia, c. 0.4 cm, margine antico 0.475 cm longa, 0.16—0.17 cm lata. Petala sepalo dorsali agglutinata, oblique oblongo-linearia, obtusa, subtruncata, concava, 1-nervia, c. 0.35 cm longa, 0.1 cm lata. Labellum calcaratum, lamina inexplana ovata, apicem versus

angustata, marginibus praesertim antice incurvis, ut videtur fascia mediana incrassata papillosaque, c. 0.26 cm longa, 0.14 cm lata, calcari deorsum spectante ovario parallelo, verosimiliter lateraliter compresso, oblongo, dorso recto, antice leviter retundato-ventricosus, obtusus, antice fere 0.4 cm, dorso bene 0.3 cm longo, glandulis stipitatis obovoideis in c. $\frac{1}{3}$ supra basin calcaris liberis, $\frac{2}{3}$ supra basin attingentibus. Gynostemium breve, maceratum cuneatum, c. 0.18 cm longum, clinandrio excavato. Stigmata brevia, obtusa, rostello conspicue breviora. Ovarium fecundatum inferne tortum, cum pedicello 0.55 cm longum.

Mentawai Islands: Isle of Siberot. (C. Boden Kloss n. 11443, 1924; "flowers white"). Environs of Siberot, forest. (Iboet n. 39, September 1924).

Geographical distribution: Endemic.

Description from herbarium (Iboet n. 39), the flowers of which were already withered.

Liparis (sect. *Rhachidibulbon*) **geophila** Schltr.! in Engl. Bot. Jahrb. XLV (1911), Beibl. No. 104, 14; J. J. S. Ic. Orch. Mal. I (1930), t. 24, IV.

Rhizoma elongatum, repens, subteres, verrucosum, vaginis paucis longe tubulosis acutis angulatis donatum, internodiis longis. Pseudobulbi c. 5.25 cm dissiti, cum rhizomate angulum acutum facientes, basi eo adpressi, lateraliter compressi, ovato-oblongi, c. 1.35 cm longi, 0.6 cm lati, vagina 1 oblongo-quiangula acuta concava c. 2.3 cm longa et folia 2 ad basin. Folia erecta; laminae oppositae, divergentes, ovatae, breviter acuminatae, acutae, apiculatae, basi late rotundatae, undulatae, costa media supra sulcata subtus carinata, nervis pluribus curvatis utrinque, reticulato-venosae, tenues, c. 3.3—4 cm longae, 2.6—2.7 cm latae; petioli erecti, canaliculati, basi in vaginam dilatati, cum vagina c. 2.5 cm longi, vagina superiore pseudobulbum arcte includente. Inflorescentia ex apice pseudobulborum novellorum, erecta, apice dense multiflora, pedunculo angulato, c. 4 cm longo, rachide costata, c. 2 cm longa. Bracteae patentes, subulatae, c. 0.5 cm longae. Flores mediocres, quaquaversi, patentes. Sepalum dorsale erectum, cum ovario angulum obtusum faciens, oblongo-ovatum, apicem versus sensim angustatum, satis acutum, convexum, 3-nervium, c. 0.65 cm longum, 0.25 cm latum. Sepala lateralia sub labello porrecta, oblique oblongo-ovata, apicem versus sensim angustata, anguste obtusa, 3-nervia, costa media dorso prominula, c. 0.6 cm longa, 0.225 cm lata. Petala patentissima, apice recurva, oblique linearia, subacuta, basi paulo dilatata, convexa 1-nervia, c. 0.53 cm longa, basi 0.075 cm, medio vix 0.05 cm lata. Labellum porrectum, cum gynostemio angulum acutum faciens, late canaliculatum cum lateribus convexis, subtus convexum cum lateribus concavis, apice recurvum, callo convexo antice breviter ovato-triangulo-producto obtuso ad basin, fascia longitudinali lineari vix elevatula in $\frac{1}{3}$ infra apicem furcata et infra apicem terminante, explanatum rotundato-subquadratum, apice late rotundatum et apice in lobulum triangulum obtusum abrupte contractum, acumine excepto breviter ciliolatum, basi trinervium, nervis exterioribus basi furcatis, c. 0.58 cm longum, 0.54 cm latum. Gynostemium arcuatum, a dorso compressum, oblongum, sectione transversa ambitu aequilateraliter trapeziforme, dorso ad basin planum, superne marginibus angulatis elevatis superne paulo dilatatis late canaliculatum cum costula inconspicua in canalicula, subtus concavum, basi

quadrangulo-dilatatum et ovario latius, c. 0.225 cm longum, clinandrio concavo cum costula longitudinali, auriculis brevibus, obtusangulis. Anthera cucullata, ambitu quinquangulato-ovata, apice triangula, acuta, basi truncata, thecis orbicularibus, 0.07 cm lata. Pollinia lateraliter compressa, triangula, extus convexa, c. 0.04 cm longa. Rostellum truncatum. Stigma parvum, transverse oblongum. Ovarium valde 6-costatum, c. 0.15 cm longum; pedicellus paulo tenuior, 6-costatus, c. 0.47 cm longus.

Sumatra: Padangsche Bovenlanden, Goenoeng Marapi, 2500 m. (*R. Schlechter* n. 15953, January 1907). Goenoeng Singgalang, c. 1700 m. (*E. Jacobson*, cult. sub n. 1227).

Geographical distribution: Endemic.

This plant is most nearly allied to *L. montana* Lndl., and in fact only distinguished from the latter by its more slender rhizome and quadrate lip. As well in my specimens as in Schlechter's authentic in Buitenzorg the lip is shortly ciliate, quite the same as in *L. montana* Lndl.

Dr E. Jacobson states that the sepals and petals are transparently amethyst-coloured, the former with a green base and apex. The lip is darker in colour with a polished greenish amethyst-coloured callus at the base. The column is transparently light green, the anther greenish white with an amethyst coloured spot at the apex.

Description from specimens preserved in alcohol.

Liparis (sect. *Platystylis*) **Lepanthes** Schltr.! in Engl. Bot. Jahrb. XLV (1911), Beibl. No. 104, 15; in Fedde Rep. Beih. LXXIV (1934), t. 20, Nr. 77; J. J. S. Ic. Orch. Mal. I (1930), t. 26, II.

Caespitosa. Pseudobulbi approximati, valde lateraliter compressi, ovati ad oblongo-ovati, acutanguli, carnosi, pallide virides, c. 1.4—2.5 cm longi, 1.2—1.4 cm lati, c. 5—6-folii. Folia articulata, patentia, anguste lanceolata, acuta, basin versus angustata, lateribus in utraque canaliculae parte supra convexa, subtus acute carinata, herbacea, tenuia, pallide viridia, interdum leviter aurantiaco-suffusa, supra vix nitidula, subtus opaca, summum maximum, ad c. 11—18 cm longum, 0.55—1.2 cm latum; vaginae pseudobulbo adnatae, summa marginibus exceptis fere tota longitudine adnata, infima sublibera, erecto-patentes, subconduplicatae, margine recurvae, apice basi folii aequilatae, pallide virides, ad c. 1.5—2.8 cm longae. Inflorescentia terminalis, laxe multiflora, subsecunda, pedunculo compresso, aecipiti, pallide viridi, c. 3.2—4.8 cm longo, vaginulis c. 3—4 bracteiformibus patentibus donato, rachide compressa, interrupte triatala, pallide viridi, c. 4.5—16 cm longa. Bractee patentes, persistentes, sessiles, rachidem semiamplectentes, ovatae, acutae, costa media supra canaliculata subtus carinata, margine papillosae, dorso c. 0.35—0.37 cm longae. Flores ad c. 28, subpatentissimi, valde aperti, convexi, aurantiaco-brunnei, opaci, c. 1.3 cm longi, ad petala c. 0.67 cm, ad sepala lateralalia 0.6 cm lati. Sepalum dorsale erectum, late ovatum, obtusum, convexum, dorso concavum et carinatum, 3-nervium, c. 0.65 cm longum, 0.6 cm latum. Sepala lateralalia deorsum spectantia, parallela, sepalum dorsale continua, parallela, marginibus proximis contigua, oblique ovata, obtusa, convexa, dorso concava et carinata, 1-nervia, c. 0.73 cm longa, 0.4 cm lata, una late ovata. Petala patentissima, divaricata, apice revoluta, e basi oblongo-

triangula lineari-subulato-acuminata, acuta, 1-nervia, c. 0.5 cm longa, basi 0.14 cm lata. Labellum parvum, sepalis lateralibus adpressum, supra basin insertum, 3-lobum, ambitu quinquangulare, basi valde transverse postice declivi-incrassatum truncatum medio tantum obtusangulatum et faciei inferiori gynostemii adpressum, callo orbiculari perforato supra basin, c. 0.4 cm, usque ad apicem loborum lateralium bene 0.2 cm longum, 0.27 cm latum, hypochyllo transversae quadrangulo, incrassationibus 2 basin versus divergentibus donato, medio concavo; lobi laterales antice brevissime liberi, rotundati; lobus intermedius porrectus, triangulus, vix acuminatus, acutus, costis 2 superne V-formiter approximatis sulco separatis et ante apicem evanescentibus, basi divergentibus breviter in hypochylium decurrentibus et abrupte terminantibus, in c. $\frac{1}{3}$ supra basin lobi intermedia dente subulato falcato-recurvo instructis, c. 0.2 cm longus, 0.15 cm latus. Gynostemium brevissimum, latius quam longum, valde a dorso compressum, ambitu transverse quinquangulare, dorso obtusangule convexum, margine alato-dilatatum, in utraque stigmatis parte dente triangulo acuto patentissimo et inferius lobulo rotundato aequilongo instructum, ala falcato-triangula obtusa recurva apice transversa subtus in utraque stigmatis parte, absque anthera c. 0.15 cm longum, 0.225 cm latum, apice in clinandrium truncatum transverse quadrangulo-ovale concavum contractum. Anthera cucullata, transverse quadrangulo-ovalis, apice recurvulo late truncata, c. 0.07 cm lata. Rostellum obtusum. Stigma alte excavatum, transverse quadrangulum, margine inferiore elevato curvato tenui. Ovarium pedicellatum 6-costatum, c. 0.4—0.45 cm longum.

Sumatra: Padangsche Bovenlanden, Goenoeng Marapi, c. 1300 m. (*R. Schlechter* n. 15976!, January 1907). Goenoeng Singgalang, c. 1900 m. (*W. Groeneveldt*, cult. in Hort. *E. Jacobson* sub nrs. 1283 and 1284).

Geographical distribution: Endemic.

This is a very characteristic species. The inflorescences of plants cultivated in Buitenzorg develop very slowly and the flowers last for a long time.

Description from living plants and specimens preserved in alcohol.

Glomera (sect. *Giulianettia*) **tenuis** (Rolfe) J. J. S. in Nova Guinea VIII (1911), 541. — *Giulianettia tenuis* Rolfe in Hook. Ic. Plant. XXVII (1899), t. 2616; in Kew Bull. 1899, 111; Schltr. Orch. D. N. Guinea (1912), 316.

Caules elongati, partibus adsunt ad 37 cm longis, laxe ramosi, hic illic radicanes, tenues, leviter flexuosi, internodiis caulis primarii 1.5—2.1 cm longis, cum vagina sicco 0.1—0.13 cm diam., ramulis patentissimis ad patentibus, majoribus inferne pauciramosis, 2.25—15 cm longis, 4—14-foliis. Folia patentia, plerumque curvula, arcuata vel leviter sigmoidea, anguste linearia, supra sulcata, subtus convexa, apice paululum attenuata, obtusa, basi paululum petiolato-attenuata, carnosula, 1.8—3.7 cm longa; vaginae tubulosae, sicco angulatae, prominenter nervosae, praesertim superne verrucosae, apice dente laminae opposito adpresso triangulo donatae, margine longiuscule fimbriatae, fimbriis ad c. 15, adpressis, subrectis, usque 0.3 cm longis. Inflorescentiae terminales, sessiles, 1-florae, plerumque cum caule angulum obtusum ad rectum facientes. Spatha tubulosa, superne unilateraliter fissi, subacuta, obtuse apiculata, bracteam

ovarium et calcar arete includens, sicco brunnea, firmula, 1.45 cm longa. Bractea similis, tubulosa, subacuta, membranacea, 1.3 cm longa. Flos medioeris, carnosulus, sepalis petalisque leviter recurvulis. Sepalum dorsale lineare, canaliculatum, acutum, longius conico-apiculatum, 1.3 cm longum, 0.25 cm latum. Sepala lateralialia oblique linearia, versus apicem angustata, acuta, longe subulato-apiculata, basi membranacea dilatata inter calcar et ovarium in lobum obtuse 2-lobulum connata, 4-nervia, 1.4 cm longa, basi 0.5 cm, supra basin bene 0.3 cm lata, apiculo 0.2 cm longo. Petala linearia, subacuta, 3-nervia, 1.1 cm longa, 0.17—0.175 cm lata. Labellum longe calcaratum; lamina gynostemio magnam partem tubuloso-adnata, eum vix superans, carnosula, leviter 3-loba subtus sulcata, expansa late transverse rhombea, 0.35 cm longa, 0.44 cm lata, lobis lateralibus erectis brevibus rotundatis, lobo intermedio late obtuse triangulo; calcar elongatum, bractea spathaque arete inclusum cum ovario angulum acutum faciens, tenue, lineare, obtusum, rectum, 1 cm longum. Gynostemium cum ovario angulum obtusum faciens, dorso convexum, absque anthera vix 0.3 cm longum, clinandrio concavo, apice porrecto bidentato. Anthera cucullata, connectivo gibboso. Stigma prominens, suborbiculare, margine inferiore producto, reflexo, bilobulato. Ovarium pedicellatum 1.25 cm longum.

British New Guinea: Mt. Scratchley, 4000 m. (*A. Giulianetti*). Mt. Albert Edward, 3680 m, common, tangled in large masses on trees in forest; "fl. green, labellum paler green with brown point." (*L. J. Brass n. 4250*, May—July 1933).

Geographical distribution: Endemic.

The figure in Hooker's *Icones Plantarum*, t. 2616, shows the spur of the lip freely projecting forward, whereas in the specimen collected by L. J. Brass on Mt. Albert Edward it is wholly enwrapped in the bract and spatha. In the other species of the section *Giulianettia* as well as in *Glossorhyncha* the spur is always enclosed so far I know. I suppose that in Giulianetti's plant it was accidentally disengaged.

Description from herbarium (*L. J. Brass n. 4250*).

Agrostophyllum (sect. *Appendiculopsis*) **trifidum** Schltr. in Engl. Bot. Jahrb. XLV, Beibl. No. 104 (1911), 22; in Fedde Rep. Beih. LXXIV (1934), Nr. 107; J. J. S. Ic. Orch. Mal. (1930), t. 31, III.

Caules numerosi, approximati, patentes vel decurvi, simplices, teretes, dilute virides, dense foliati, ad c. 45 cm longi, 0.17 cm crassi, internodiis c. 0.35—0.4 cm longis. Folia alternatim bifaria, rectangule patentissima, parva, remota, basi abrupte contracta semitorta, oblonga, apicem versus leviter angustata, apice lata satis profunde rotundato-biloba, mucrone minimo inter lobos, plana, coriacea, impressionibus foliorum inferiorum notata, viridia, ad c. 1.1 cm longa, 0.5 cm lata; vaginae internodia multo superantes, inferne tubulosae, superne antice fissae, margine mox exarescentes, utrinque lacinulam subulatam c. 0.15 cm longam gerentes. Inflorescentiae terminales, capituliformes, e racemulis paucis unifloris compositae, basi squamis siccis suffultae. Bractee oblongae, concavae, pellucidae. Flores parvi, c. 0.9 cm lati, sepalis petalisque flavescenti-albis. Sepalum dorsale erectum, oblongum, obtusum, apicem recurvum, c. 0.5 cm longum, 0.25 cm latum. Sepala lateralialia ad pedem gynostemii brevissimum decurrentia,

mentum saccatum obtusissimum formantia, basi concava, superne recurva, oblique ovato-triangulari, acute acuminata, costa media dorso prominente, usque ad apicem ovarii c. 0.45 cm, tota c. 0.6 cm longa. Petala oblique erecta, sublinearia, subfalcatula, acuta, convexa, c. 0.4 cm longa, basi 0.1 cm lata. Labellum saccato-calcaratum, 3-lobum, album, totum c. 0.5 cm longum, inter lobos callo maximo, lobo medio parallelo porrecto, recto, cymbiformi, obtuso, postice in lobos laterales decurrente, lobos bene aequante, c. 0.27 cm longo donatum; saccus cum ovario angulum acutum formans, rotundatus, albus, c. 0.2 cm longus; lobi laterales aliformes, elongati, oblique erecti, lineares, obtusi, convexi, albi, apice et margine atropurpurei; lobe intermedius erectus, haud recurvus, ovato-cordatus, lobulis basilaribus rotundatis, apice obtusus subtrilobulatus, convexus. Gynostemium cum ovario angulum obtusum faciens, clavatum, subtus sulco longitudinali costis limitato, album, c. 0.25 cm longum, auriculis obtusis, concavis, tenuiter purpureo-marginatis. Anthera cucullata, breviter cordata, obtusa, alba. Pollinia 8, clavata, flava, glandula oblonga. Rostellum elongatum, incurvum, lineare, integrum, obtusum, antheram multo superans. Stigma transverse obtriangulum. Ovarium 6-sulcatum, dilute viride, c. 0.6—0.7 cm longum.

Sumatra: Lampong. (Cult. in *Hort. Bog. II M, d 118*). Bengkoelen, Kroeï. (*A. Bouman—Houtman n. 20*). Padangsche Bovenlanden, Padang Pandjang, c. 800 m. (*R. Schlechter n. 15964*, January 1907; *n. 16029*, February 1907). Agam, Boekit Batoe Balah. (*E. Jacobson n. 846*).

Borneo: Sarawak, Quop. (*J. Hewitt*, October 1908). Dutch Borneo, G. Labang. (Expedition for rectification of the frontiers in North Borneo, *Amdjah nrs. 269* and *279*, July 1912; also liv. pl. cult. in *Hort. Bog. sub n. 43*). Loembis. (As quoted, *Amdjah n. 228*, July 1912). G. Agisan. (As quoted, *Amdjah*, liv. pl. cult. in *Hort. Bog. sub n. 96*).

In the shape of the rostellum and pollinia this species agrees with *A. bicuspidatum* J. J. S.

Schlechter described the sidelobes of the lip as belonging to the callus under them.

Description from cultivated specimens.

Ceratostylis (sect. *Pleuranthemum*) **scariosa** Ridl. in Journ. Mal. Br. R. As. Soc. I (1923), 96.

Rhizoma elongatum, dependens, ramosum, serpentinum, tenue, basi radicans, c. 40 cm longum, vaginis longis sese amplectentibus tubulosis longe acuminatis rumpentibus et irregulariter membranaceo-marginatis omnino obtectum. Caules (pseudobulbi) c. 2—3.25 cm dissiti, brevissimi, c. 0.4—0.6 cm longi, 1-folii. Folium lineari-lanceolatum, vix ovatum, apicem versus sensim angustatum, apice valde oblique obtusum vel anguste obtusum, basi breviter canaliculato-petiolato-contractum, costa media sicco dorso prominula, totum c. 7.5—11.5 cm longum, sicco 0.9—0.5 cm latum, petiolo 0.45—0.4 cm longo; vagina caulem continua, canaliculata, basi tubulosa, c. 1 cm longa. Inflorescentia fasciculata, pedunculis filiformibus, erecto-patenter pubescentibus, c. 1.6 cm longis, 1-floris. Bractea adpressa, oblongo-triangulari, leviter acuminata, acuta, concava, bene 0.3 cm longa. Flos maceratus c. 1.15 cm longus, sepalis dorso pubescentibus petalisque leviter divergentibus. Sepalum dorsale lineari-lanceolatum, apicem versus angustatum, obtusum, 3-nervium, nervis exterioribus basi

furcatis, c. 0.975 cm longum, 0.23 cm latum. Sepala lateralia lacinia brevi valde concava ad pedem gynostemii decurrentia, mentum breve reversum ovario adpressum inflatum subglobosum c. 0.2 cm longum formantia, oblique triangulo-lanceolata, subfalcata, apice incurvulo (an semper?), subacuta 5-nervia, c. 0.9 cm, usque ad apicem ovarii 1.2 cm longa. Petala oblique sublinearia, apicem versus angustata, anguste obtusa, 3-nervia, c. 875 cm longa, 0.16 cm lata. Labellum unguiculatum, 3-nervium, nervis exterioribus inferne verosimiliter elevatis, leviter 3-lobum, c. 0.975 cm, explanatum fere 1.1 cm longum, ungue cum pede gynostemii fenestram faciente, subrectangule patente, supra medium subrectangule incurvo, cum lamina angulos obtusos faciente, oblongo, apice dilatato, c. 0.2 cm longo, lamina porrecta, gynostemio parallela, concava, lobis lateralibus brevibus latis rotundato-obtusangule triangulis mesochilium rhombeum minute ciliolatum c. 0.475 cm longum 0.38 cm latum formantibus, epichilio (lobo intermedio) oblongo-triangulo, anguste obtuso, c. 0.38 cm longo, 0.16 cm lato. Gynostemium breve, bifidum, c. 0.24 cm longum, brachiis latis, incurvulis, oblongo-subtriangulis, obtusis. Pes gynostemii reversus, cum ovario angulum acutum faciens, incurvus, linearis, c. 0.2 cm longus. Ovarium sessile, lanatum, c. 0.5 cm longum.

Sumatra: East coast, Berastagi, 1400 m. (*H. N. Ridley*, 1921; *Mrs. E. H. Burkill nrs. 16319 and 16320*, 13 November 1924; "flowers cream coloured").

Geographical distribution: Endemic.

Description from herbarium.

Ceratostylis (Sect. *Euceratostylis*) **leucantha** Schltr.! in Engl. Bot. Jahrb. XLV (1911), Beibl. No. 104, 21; in Fedde Rep. Beih. LXXIV (1934), t. 25, Nr. 99; J. J. S. Ic. Orchid. Mal. I (1930), t. 36, I.

Rhizoma breve, valde ramosum. Caules fasciculati, teretes, c. 15—22 cm longi, 0.14—0.2 cm diam., 1-folii, nonnullis vaginis tubulosis mox exarescentibus et membranaceis reticulato-venosis ad c. 0.4 cm longis ad basin. Folium erectum, subteres, supra a basi usque ad apicem sulcatum, in utraque sulci parte convexum, apice planum, acutum, c. 3.2—3.9 cm longum, 0.175—0.225 cm latum; vagina brevissima et paulum contracta. Inflorescentiae fasciculares, paucos flores simultanee gignentes, pedunculis brevibus, 1-floris, c. 0.2 cm longis, pluribus vaginulis imbricatis inferioribus ovatis ad ovato-rotundis superioribus accrescentibus plerumque breviter acuminatis ad c. 0.5 cm longis donatis. Bractea conspicua, vaginulis similis, rotundato-ovata, rotundata, acute subulato-acuminata, concava, membranacea, c. 0.46 cm longa. Flores in sectione majusculi. Sepalum dorsale subobovato-oblongum, satis acutum, leviter concavum, glabrum, 3-nervium, c. 0.675 cm longum, 0.27 cm latum. Sepala lateralia lacinia brevi oblique triangula concava ad pedem gynostemii decurrentia, mentum breve reversum ovario adpressum a dorso compressum rotundato-quadrangulum vix retusum c. 0.13 cm longum, 0.17 cm latum formantia, marginibus anticis inferne contigua, parte superiore divergentia, oblique oblonga, obtusa, inferne levissime contracta, glabra, 3-nervia, c. 0.725 cm, tota 0.9 cm longa, 0.25 cm lata. Petala suboblique oblonga, obtusa, leviter concava, 3-nervia, c. 0.65 cm longa, 0.26 cm lata. Labellum elongatum, undatum, angustum, inexplanatum ambitu lineare, 2/3 partibus inferioribus marginibus tenuibus ciliolatisque erectis canaliculatum, 3-nervium, minutis-

sime papillosum, costis 2 usque in $1/3$ supra basin papillosis, infra apicem sensim convexo-incrassatum, incrassatione inferne in formam costae convexae papillosae decurrente, subtus convexum cum sulco longitudinali, explanatum e basi brevissime unguiculata eciliata oblongo-subovale, infra medium longe lineari-contractum, obtusum, c. 0.8 cm longum, inferne 0.2 cm, superne bene 0.1 cm latum. Gynostemium brevissimum, supra visum quadrangulum, usque ad medium in brachia 2 late ovalia rotundata extus convexa cum costa obliqua intus concava partitum, c. 0.1 cm longum. Anthera cucullata, brachia subaequans, suborbicularis, basi paululum dilatata et 4-lobulata, apice rotundata, c. 0.075 cm lata. Pes gynostemii ovario adpressus, gynostemio multo angustior, rectus, apicem versus angustatus, c. 0.1 cm longus. Ovarium pedicellatum leviter 6-suleatum, parcissime pilosum, c. 0.3 cm longum.

Sumatra: Palembang, Goenoeng Dempoe, 2000 m. (Exp. E. Jacobson, *Ajoeb n. 453*, August 1916). Padangsche Bovenlanden, Kerintji, Pintoe Rimbo, 1400 m. (E. Jacobson *n. 2562*, September 1915). Goenoeng Singgalang, 1700 m. (E. Jacobson, cult. sub *n. 1200*). Goenoeng Merapi, 2700 m. (R. Schlechter *n. 159541*, January 1907). As quoted, 1800—2000 m, forest on trees. (H. A. B. Bünnemeijer *nrs. 4552, 4608, 4659 and 4724*, September 1918). Goenoeng Sago, 1900—2000 m, forest and copse, terrestrial. (H. A. B. Bünnemeijer *nrs. 3959 and 4359*, July—August 1918). Goenoeng Malintang, 2200 m, in copse. (H. A. B. Bünnemeijer *n. 4052*, July 1918). Goenoeng Talang, Laras Talang, 1800 m and 2200 m, forest. (H. A. B. Bünnemeijer *nrs. 5222 and 5381*, October and November 1918).

Geographical distribution: Endemic.

A very distinct species, the flowers of which, however, vary considerably in size. Amongst the plants collected by Dr Jacobson, there were none with so long leaves as in Schlechter's specimens. Schlechter's type in Buitenzorg is flowerless, but the description is good.

Description from herbarium and specimens preserved in alcohol.

Podochilus (sect. *Apista*) **muricatus** (T. et B.) Schltr. in Mém. Herb. Boiss. No. 21 (1900), 64; Ridl. Mat. Fl. Mal. Penins. I (1907), 196. — *Appendicula muricata* T. et B. in Nat. Tijdschr. Ned. Ind. XXIV (1862), 322; Ridl. in Journ. Linn. Soc. Bot. XXXII (1896), 392; Fl. Mal. Penins. IV (1924), 197; J. J. S. in Fl. Buit. VI, Orch. (1905), 516. — *A. echinocarpa* Hook. f. Fl. Br. Ind. VI (1890), 85; Ic. pl. XXII (1894), t. 2152.

Caules approximati, simplices vel deinde interdum pauciramosi, teretes, tenues, c. 7.5—14 cm longi, 0.125—0.14 cm diam., foliati, internodiis c. 0.25—0.45 cm longis. Folia plus minusve patentissima, basi semitorta, ovalia, ovato-ovalia vel suborbicularia, apice plus minusve oblique breviter et obtuse bilobula cum mucrone subulato interposito, basi rotundata semiamplexicaulia, costa intermedia dorso versus apicem prominente, carnosula, sicco incrassato-marginata, c. 0.8—1 cm longa, 0.45—0.93 cm lata; vaginae tubulosae. Inflorescentiae terminales et (vel) e nodis superioribus abbreviatis efoliatis, brevissimae, c. 1—3-florae, pedunculo vaginulato cum rachide flexuosa c. 0.4—0.5 cm longa. Bractee conspicuae, patentes vel patentissimae, suborbiculares vel ovato-orbiculares, apiculatae, concavae, carinatae, 1-nerviae, c. 0.24—0.3 cm longae. Flores in genere majusculi, vix aperti, c. 0.7 cm longi, sepalis dorso valde patenter conico-muriculatis petalisque parallelis. Sepalum dorsale horizontale, ovatum, obtusum, muriculato-apiculatum, valde concavum, 3-nervium, c. 0.6 cm longum, 0.28 cm latum. Sepala lateralia lacinia oblique suborbiculari valde

excavato-concava ad pedem gynostemii decurrentia, mentum subglobosum cum ovario angulum acutum faciens c. 0.2 cm longum formantia, oblique triangula, acuta cum mucrone longiusculo muriculato, concava, 3-nervia, c. 0.5 cm, tota c. 0.7 cm longa, basi obliqua c. 0.4 cm, supra basin 0.25 cm lata. Petala subovato-oblonga, apice leviter contracta, anguste obtusa, subapiculata, plana, glabra, 1-nervia, c. 0.4 cm longa, 0.15 cm lata. Labellum porrectum, supra basin et in 2/3 partibus supra basin obtusangule recurvum, apice incurvulum, pedi gynostemii et gynostemio parallelum. concavum, subtus convexum cum sulco inconspicuo, 3-nervium, ungue breviusculo, valde concavo, subtus longitudinaliter canaliculato, lamina oblonga, apicem versus sensim leviter dilatata, breviter acute conico-acuminata, callo reverso conico obtuso intus ad apicem, appendice reversa quadrangula apicem versus subrecta apice leviter dilatata recurva et brevissime late obtuse bilobula sulcis 2 longitudinalibus convexo-tricostulata, 3-nervia carnosula ungue aequilata sed brevior ad basin, lobulo parvo marginali rotundato incurvo utrinque ad basin appendicis, glabrum, intus ad basin appendicis villosulum, fascia mediana longitudinali carnosula, explanatum totum bene 0.6 cm longum, ad lobulos laterales 0.175 cm latum, lamina 0.475 cm longa, basi 0.16 cm, superne 0.26 cm lata, appendice ad apicem c. 0.15 cm lata. Gynostemium breve, usque ad apicem rostellii c. 0.37 cm longum, in utraque stigmatis parte brachio conspicuo sed gynostemio multo brevior porrecto oblique triangulo apice recurvo subfalcato subacuto extus concavulo intus convexo instructum, clinandrio magno, elongato-ovato, marginibus incurvis valde canaliculato, in rostellum canaliculatum subtus convexum longe acute bidentatum producto. Anthera in clinandrium immersa, cucullata, e basi oblique subglobosa longe angustata et in dentes 2 acutissimos exeuns, leviter a latere compressa, basi minute 2-lobulata, connectivo carinata, c. 0.28 cm longa. Pollinia 4, inaequalia, valde a latere compressa, 2 minora late obovata, apice rotundata, extus convexa, intus concava, c. 0.07 cm longa, majora falcato-pyriformia, apice rotundata, costula obliqua instructa, c. 0.08 cm longa; stipites 2, lateraliter compressi, lineares, superne late spathulato-dilatati et infundibuliformi-convoluti, glandula oblongo-elliptica; pollinarium totum c. 0.3 cm longum. Pes gynostemii cum ovario angulum acutum faciens, linearis, inferne rectus canaliculatus et intus villosulus, apice incurvus, a sepalis lateralibus liber, glaber, inexplanatus c. 0.2 cm longus. Ovarium sessile, brevissimum, dense et longe muriculatum, c. 0.2 cm longum. Capsula sessilis, floris reliquis coronata, ellipsoidea, 6-costata, in costis longe et ramoso-muriculata, c. 0.8 cm longa.

Sumatra: Padangsche Bovenlanden, Boekit Djarat, c. 1500 m. (*E. Schlechter* n. 16010, February 1907). Tanang Taloe, 1100 m, in forest. (*H. A. B. Binnemeijer* n. 1160, June 1917).

Geographical distribution: Malacca, Java.

In habit this interesting species deceptively resembles an *Appendicula*, in the flowers it is however a true *Podochilus*.

The leaves of the plants I examined are much larger than those described by Teysmann and Binnendijk.

In Java the species has not been recovered since Teysmann and Binnendijk.

Description from herbarium and flowering branches preserved in alcohol.

Appendicula (sect. *Euappendicula*) **rubens** Schltr. Orch. D. Neuguinea (1912), 336; in Fedde Rep. Beih. LXXIV (1934), t. 53, Nr. 210; J. J. S. Ic. Orch. Mal. (1930), t. 28, I. — *Podochilus rubens* Schltr.! in Engl. Bot. Jahrb. XLV (1911), Beibl. No. 104, 18.

Caules approximati, simplices, teretes, c. 15 cm vel plus longi, 0.14 cm diam., cum foliis c. 1.9—2 cm lati, internodiis c. 0.35—0.4 cm longis. Folia patentissima vel subpatentissima, basi semitorta, semiamplexicaulia, oblique ovata ad oblongo-ovata, breviter bidentata vel bilobulata cum mucrone longiore interposito, convexa, rigidiuscula, c. 0.95—1.15 cm longa, 0.5—0.7 cm lata; vaginae tubulosae, internodia superantes. Inflorescentiae terminales et axillares, brevissimae, subsessiles, nutantes, densissime multiflorae, rachide c. 0.6—1.3 cm longa. Bractee quaquaversae, reflexae. ovato-oblongae, concavae, ad c. 0.3 cm longae, superiores minores. Flores parvi, patentissimi, c. 0.6 cm lati, sepalis dorso sparse furfuraceo-punctatis. Sepalum dorsale cum ovario angulum acutum faciens, ovatum, obtusum, concavum, 3-nervium, c. 0.34 cm longum, fere 0.25 cm latum. Sepala lateralialia cum pede gynostemii mentum breve latum cum ovario angulum subrectum faciens leviter a dorso compressum apice rotundatum c. 0.17 cm longum formantia, basi antice breviter connata, recurva, oblique triangula, subacuta, basi concava, ceterum convexa, 3-nervia, bene 0.325 cm longa, basi 0.3 cm lata. Petala oblique rhombea, obtusa, basi subcontracta, concavula, 1-nervia, fere 0.3 cm longa, 0.2 cm lata. Labellum basi pedi gynostemii brevissime saccato-adnatum, erectum, concavum, inferne marginibus pedi gynostemii adpressum, apice valde recurvo convexum, basi antice leviter inflatum et sulco longitudinali didymum, appendice basilarium hippocrepidiformi, quam partem basilarem labelli paulo brevior et angustior, concava, marginibus usque ante medium labelli decurrente, 3-nervium, nervis exterioribus ramosis, explanatum late ellipticum, simplex, obtusum, c. 0.375 cm longum, 0.275 cm latum. Gynostemium cum ovario angulum obtusum faciens, dorso convexum, c. 0.175 cm longum, clinandrium concavo, ovato, dorso obtuso, marginibus utrinque dentifero. Anthera cucullata, cordata, lobulis basilaribus obtusis in clinandrium immersa, apice elongata, minute 3-denticulata, basi gibbosa, c. 0.125 cm longa. Pollinia 6, inaequalia, oblique anguste clavata, apice obtusa, basi acutissima, maxima c. 0.08 cm longa, stipitibus 2 basi connatis linearibus canaliculatis, cum glandula parva lanceolata c. 0.08 cm longis. Rostellum porrectum, conspicuum, triangulum, acute 2-dentatum, concavum, subtus convexum. Stigma transversum, margine inferiore in dentem triangulum productum. Pes gynostemii cum ovario angulum rectum faciens, rectus, rectangule oblongus, medio leviter canaliculatus, c. 0.15 cm longus. Ovarium rectum, etortum, 6-sulcatum, c. 0.3 cm longum. Fructus immaturus sessilis, patentissimus, alte 6-sulcatus.

Sumatra: Padangsche Bovenlanden, Boekit Djarat, c. 1500 m. (liv. pl. cult. in Hort. Wichers, R. Schlechter n. 16006!). Tanang Taloe, 1100 m. (H. A. B. Bünne-meijer n. 1160a, June 1917). Palembang, Goenoeng Dempoe, 1700 m. (Exp. E. Jacobson, Ajoeb n. 496, August 1916).

Geographical distribution: Endemic.

I found some differences with Schlechter's description, hence I have given a fresh one.

Description from specimens preserved in alcohol.

Appendicula (sect. *Pododesme*) **effusa** Schltr. Orch. D. N. Guinea (1912), 336; in Fedde Rep. Beih. LXXIV (1934), t. 52, Nr. 206; J. J. S. Ic. Orch. Mal. I (1930, t. 29, III. — *Podochilus effusus* Schltr. in Engl. Bot. Jahrb. XLV (1911), Beibl. Nr. 104, 19.

Caules approximati, elongati, simplices, compressi, pallide virides, c. 10—36 cm longi, internodiis 0.35—0.5 cm longis. Folia patentia, basi semitorta, inferiora plerumque suborbicularia, sequentia ovalia ad oblonga, obtusa ad rotundata, plerumque emarginata cum mucrone, costa media supra sulcata, nitidule viridia, subtus opaca, interdum purpureo-suffusa, c. 0.65—1.8 cm longa, 0.3—0.6 cm lata; vaginae tubulosae, valde compressae, apice antice excisae, internodia superantes. Inflorescentiae terminales et axillares, vaginas 2 perforantes, elongatae, inferne raro apice plerumque ramosae, pedunculo tenui, serpentino, c. 2.5—11 cm longo, internodiis longis, vaginulis tubulosis acutis, rachide brevissima, dense multiflora, verruculosa, c. 0.5—1.25 cm longa. Bractee reflexae, ovatae, concavae, c. 0.2—0.3 cm longae, superiores minores. Flores parvi, pallide virescentes, purpureo-suffusi, bene 0.3 cm lati, toti 0.4 cm longi, sepalis petalisque conniventibus. Sepalum dorsale ovarium subcontinuum, ovatum, obtusum, concavum, costa media dorso prominente, c. 0.26 cm longum, 0.18 cm latum. Sepala lateralibus cum pede gynostemii mentum breve reversum obtusissimum a latere visum rotundatum c. 0.13 cm longum formantia, divergentia, angulum acutum facientia, oblique triangula, obtusa, 3-nervia, costa media dorso prominente, c. 0.27 cm longa margine antico 0.325 cm, basi 0.25 cm metientia. Petala basi leviter concava, apice recurvula, suboblique oblonga, obtusa, 1-nervia, bene 0.2 cm longa, 0.08 cm lata. Labellum apici pedis gynostemii insertum, valde concavum, apice recurvulum porrectumque, leviter 3-lobum, 5-nervium, appendice anguste alteque hipposrepidiformi basin labelli attingente carnosula antice in margines labelli decurrente, explanatum c. 0.3 cm longum et latum, lobis lateralibus erectis rotundatis, lobo intermedio lato transverse oblongo, leviter retuso cum callo parvo breviter obtuse producto in sinu, antice utrinque rotundato, c. 0.08 cm longo, fere 0.2 cm lato. Gynostemium breve, latum, in utraque stigmatis parte rotundato-dilatatum, c. 0.14 cm longum, clinandrio concavo cum costula longitudinali, dorso obtuse trigono. Anthera cucullata, rotundato-trigona, longe et anguste rostrata, basi bilobula, connectivo basi gibbosa, fere 0.1 cm lata. Pollinia 6, oblique obovata, angulata, cum stipite tenui apice bivalvate et glandula parva 0.1 cm longa. Rostellum porrectum, acute bidentatum. Stigma triangulum. Pes gynostemii reversus, cum ovario angulum acutum faciens, apice incurvus, sigmoideus, oblongus, concavus, c. 0.15 cm longus. Ovarium 6-sulcatum, leviter verruculosum, cum pedicello brevi c. 0.225 cm longum. Capsula breviter pedicellata, flore sicco coronata, oblonga, subobovoidea, trigona, obtusa, basi acuta, costa applanata in lateribus, c. 0.5 cm longa, 0.23—0.25 cm diam.

Sumatra: West coast, Goenoeng Marapi, c. 1200 m, in forest. (*R. Schlechter* n. 16035!, January 1907). Kerintji Peak, 1200—1700 m, in forest. (*H. A. B. Bünn-*

meijer nrs. 8383, 8439, 8534, 8618, 8785, 8894, 8953, 8982, 9050, 9067, fl. and fr. in March 1920).

Geographical distribution: Endemic.

The nearest ally of this plant is *A. infundibuliformis* J. J. S., not *A. elegans* Rehb.f. as Schlechter suggests.

Description from *Bünnemeijer n. 8618*.

Phreatia (sect. *Bulbophreatia*) **sumatrana** Schltr. in Engl. Bot. Jahrb. XLV (1911), Beibl. No. 104, 54; Krzl. in Pflanzenr. IV. 50. II. B. 23 (1911), 21.

Planta caespitifica, dense radicans. Pseudobulbi approximati, parvi, omnino vaginis inclusi, 2—3-folii. Folia linearia, oblique obtusa, leviter rotundato-biloba cum mucrone lateraliter compresso, basin versus angustata conduplicataque, costa media dorso carinata, sicco rigidula, infima parva, c. 5.75—12.5 cm longa, sicco 0.6—0.85 cm lata; vaginae sese amplexantes, tubulosae, c. 1.5—2.2 cm longae. Inflorescentiae erectae, folia superantes, subaxe multiflorae, pedunculo c. 7.5—12 cm longo, vaginulis c. 6 tubulosis acuminatis acutis carinatis ad c. 1.2—1.4 cm longis donato, rachide interrupte 5-costata, c. 4.5—10 cm longa. Bractee e basi oblongo-triangulo-dilatata longe filiformi-subulato-acuminatae, concavae, marginibus inferne recurvulis, 1-nerviae, ad c. 0.65 cm longae, 0.125 cm latae. Flores parvi, patentissimi, c. 0.3 cm lati, 0.27 cm longi. Sepalum dorsale erectum, cum ovario angulum obtusum faciens, incurvum, concavum, ovato-triangulum, leviter obtuse acuminatum, 1-nervium, c. 0.15 cm longum, bene 0.1 cm latum. Sepala lateralalia ad pedem gynostemii decurrentia, patentissima, late oblique ovata, subacute acuminata, praesertim latere antico ad basin concava, apicem versus canaliculato-conduplicata, 1-nervia, nervo dorso prominulo, c. 0.175 cm longa, 0.15 cm lata, margine antico 0.225 cm metientia. Petala oblique porrecta, divergentia, subplana, apicem versus canaliculata, oblique subovato-ovalia, obtusa, basi brevissime unguiculata, 1-nervia, c. 0.125 cm longa, 0.075 cm lata. Labellum parvum, pedem gynostemii subaequans, unguiculatum, lamina rectangule recurvum, glabrum, 3-nervium, inexplanatum c. 0.125 cm, explanatum 0.15 cm longum, ungue inexplanato oblongo, dimidio inferiore utrinque conspicue subrotundato-dilatato, marginibus erectis sacculato, c. 0.08 cm longo, basi 0.075 cm, superne fere 0.05 cm lato, abrupte in laminam dilatato, lamina ungue bene latiore, subsemiorbiculari, basi subtruncata cum ungue angulos subrectos faciente, angulis lateralibus obtusa, antice rotundata et crasse obtuse apiculata, c. 0.06 cm longa, 0.125 cm lata. Gynostemium cum ovario angulum obtusum faciens, breve, dorso convexum, cum anthera fere 0.1 cm longum, clinandrio alte excavato. Anthera cucullata, supra visa transverse quinquangularis, apice obtusangula, basi 4-lobulata, c. 0.06 cm lata. Pollinia 8. Rostellum alte acute bidentatum. Stigma transversum, margine inferiore rotundatum, margine superiore truncatum. Pes gynostemii reversus, ovario adpressus, apice incurvulus, e basi dilatata convexa contractus, fere 0.1 cm longus. Ovarium oblique fusiforme, obtuse 6-costatum, c. 0.25 cm longum, cum pedicello tenuiore 0.3 cm longo clavatum.

Sumatra: West coast, Pariaman, Padang Pandjang, 1000 m. (*R. Schlechter n. 15963 type*, January 1907). Laras Talang, Boekit Gombak, 1600 m, epiphytical in forest. (*H. A. B. Bünnemeijer n. 5442*, November 1918; "flowers white, bracts light green").

Geographical distribution: Endemic.

Though I have not seen the type specimen I think that this specimen belongs to *Phr. sumatrana* Schltr. It differs from Schlechter's description in the fewer and longer leaves, and I would not describe the blade of the lip as reniform.

Description from *Bünnemeijer n. 5442*.

Plocoglottis (sect. *Phyllocaulos*) **moluccana** Bl. Mus. Bot. Lugd. Bat. I (1849—'51), 47; Flora Jav. n. ser. I (1858), 53, t. 16; J. J. S. Ic. Orch. Mal. I (1930), t. 39, II.

Caulis pars praesens 6-folia. Folia erecto-patentia, lanceolata, sensim acuminata, acuta, nervis 5 dorso prominentibus, ad c. 26 cm longa, 4.6 cm lata, summum angustissimum, basi angustata canaliculata et sensim in vaginam longe tubulosam c. 7 cm longam vergentia. Inflorescentia laxa multiflora, pedunculi parte praesente c. 7.2 cm longa, pubescenti, vaginulis c. 5 tubulosis et 2 bracteiformibus donata, rachide pubescenti, 28 cm et plus longa. Bractee ovato-lanceolatae, longe acuminatae, pubescentes, ad c. 1.5 cm longae. Flores c. 3 cm longi, sepalis dorso patentissime pubescentibus. Sepalum dorsale erectum, cum ovario angulum obtusum faciens, apice recurvulum, lanceolato-triangelum, apice angustato conduplicatum, subacutum, concavum, intus parce puberulum, basi 3-nervium, nervis exterioribus ramosis, c. 1.6 cm longum, 0.57 cm latum. Sepala lateralia deflexa, oblique lanceolata, subsigmoidea, apice conduplicata, acute conico-apiculata, apiculo lateraliter compresso, concava, intus parce puberula, basi 3-nervia, nervis exterioribus ramosis, c. 1.7 cm longa, fere 0.6 cm lata. Petala erecta, oblique sublinearia, apice contracto-acuminata, convexa, utrinque parce pubescentia, basi 3-nervia, nervis exterioribus ramosis, c. 1.4—1.5 cm longa, 0.325—0.3 cm lata. Labellum ungue brevi cuneato concavo c. 0.17 cm longo pedi gynostemii in formam calcaris brevissimi reversi lateraliter compressi obtusi in faciem inferiorem laminae cariniformi-decurrentis adnatum, inferne membranis 2 intramarginalibus triangulis gynostemio elastice affixum, supra convexum cum canalicula longitudinali, incrassationibus 2 convexis basi rotundatis intus supra basin, subtus valde concavum, basi 3-nervium, nervis exterioribus valde ramosis, lamina explanata quadrata, angulis rotundata, apice paulo dilatata, truncata, medio in acumen revolutum anguste triangulum acutum c. 0.17 cm longum abrupte acuminata, absque acumine c. 0.66 cm longa, basi 0.64 cm, apice 0.74 cm lata. Gynostemium erectum, cum ovario angulum obtusum faciens, crassum, lateraliter compressum, dorso curvulum, obtusum, parce puberulum, subtus infra stigma longitudinaliter canaliculatum, absque anthera c. 0.6 cm longum, clinandrio triangulo, concavo. Rostellum bidentatum. Stigma subquadrangulum. Pes gynostemii cum ovario angulum rectum faciens, c. 0.1 cm longus. Ovarium pubescens, c. 1.5 cm longum.

Ambon. (A. Zippelius, Herb. Lugd. Bat. n. 903, 16—2507).

Geographical distribution: Endemic.

Blume's description is not quite adequate; hence I give a fresh one. Zippelius' material at Leiden consists in the upper portion of a stem and a single inflorescence.

The species has not been collected again.

Description from herbarium.

Calanthe (sect. *Eucalanthe*) **crumenata** Ridl. in Journ. Fed. Mal. St. Mus. VIII (1917), 107; J. J. S. Ic. Orch. Mal. I (1930), t. 41, I.

Pseudobulbi approximati, paucifolii. Folia petiolata, lanceolata, acute acuminata, basi sensim in petiolum angustata, utrinque glabra, nervis c. 7 quorum 3 intermediis validissimis, omnibus in sicco supra subtusque prominentibus, c. 10—30 cm longa, 3.2—9 cm lata; petiolus canaliculatus, costatus, cum vagina c. 3—17 cm longus. Inflorescentiae erectae, dense multiflorae, deinde laxiores, pedunculo parce et brevissime puberulo, c. 17—62 cm longo, vaginulis c. 3 tubulosis ad c. 2.5—3.5 cm longis donato, rachide brevissime puberula, c. 2—9.25 cm longa. Bractee e basi concava recurvae, ovato-lanceolatae, acutae, c. 1.1—3.5 cm longae, 0.675 cm latae. Flores mediocres. Sepalum dorsale ellipticum ad oblongo-ellipticum, obtusum vel obtusiusculum, convexum, dorso parce furfuraceo-puberulum, 3-nervium, c. 0.95—1.7 cm longum, 0.5—0.675 cm latum. Sepala lateralialia oblique elliptica ad elliptico-oblonga, subobtusa et conduplicato-apiculata, dorso furfuraceo-puberula, 3-nervia, c. 1—1.75 cm longa, 0.5—0.7 cm lata. Petala oblique elliptico-oblonga ad lanceolata, interdum subspathulata, acutiuscula, basi parcesime ciliolata, 3-nervia, nervo medio dorso sulcato, c. 1—1.75 cm longa, 0.45—0.65 cm lata. Labellum inferne longitudine c. 0.3—0.4 cm gynostemio adnatum, calcaratum, lamina triloba, basi seriebus 3 longitudinalibus verrucarum inferne in costas connatarum ima basi in costas 2 confluentibus, seriebus exterioribus brevibus, serie intermedia longe producta, explanata ambitu obovata, 3-nervia, plus minusve puberula vel subglabra, ad c. 1.7 cm, usque ad apicem loborum lateralium 1.25 cm longa, ad lobos laterales ad c. 1.15 cm lata; lobi laterales porrecti, longe adnati, antice tantum liberi, basin lobi intermedii tegentes, parte libera oblique orbiculari-ovati, rotundati, plerumque plus minusve ciliolati, parte libera ad c. 0.45 cm longi; lobus intermedius transversus, plus minusve obreniformis, breviuscule rotundato-bilobulus, repandulus ad crenulatus, ad c. 0.8 cm longus, 1 cm latus; calcar breve, reversum, clavatum, obtusum, interdum parce puberulum, ad c. 0.8 cm longum. Gynostemium breve, tota longitudine basi labelli adnatum, oblique clavatum, apice valde incrassatum, subtus canaliculatum, utrinque costula longitudinali instructum, parce pilosum, c. 0.4 cm longum, 0.37 cm latum, lobis stigmaticis oblique quadrangulis, truncatis. Anthera cucullata, a dorso compressa, subsemiorbicularis, subreniformis, apice in rostrum breve valde recurvum producta, c. 0.2 cm lata. Pollinia 8, valde inaequalia, pyriformia. Ovarium 6-sulcatum, c. 1 cm longum, cum pedicello c. 1 cm longo furfuraceo-pilosum.

Sumatra: West coast, Kerintji Peak, 2100—2500 m, in forest, common. (*H. C. Robinson and C. Boden Kloss*; *H. A. B. Bunnemeijer nrs. 7403, 9661, 9732, 9780 pp., 9901 pp., 9942, 10034, 10360, 10418*, April—May 1920). Padangsche Bovenlanden, Goenoeng Talamau, north-western slope, 1700 m, in forest. (*H. A. B. Bunnemeijer n. 726*, May 1917; nat. name Katari boelan). Goenoeng Talang, 2100 m, in forest; 1 plant. (*H. A. B. Bunnemeijer n. 5220*, October 1918). Palembang, Goenoeng Dempoe, 2200 m. (Expedition *E. Jacobson, Ajoeb n. 533*, August 1916).

Geographical distribution: Endemic.

This plant is most nearly allied to *C. abbreviata* Lndl. and it is a question whether it would not be better regarded as a variety. It differs

properly in the lip blade not being unguiculate and in the short broad midlobe.

In the specimen collected on Mt. Dempoe the hairiness of the lip is quite the same as in *C. abbreviata* Lndl., in those from Kerintji Peak it is less conspicuous or nearly wanting.

In n. 9661 the lip is provided with ridges produced to the apex of the midlobe.

The flowers are white changing to pale yellow or orange.

Description from herbarium and flowers preserved in alcohol.

Calanthe (sect. *Eucalanthe*) **longibracteata** Ridl. in Journ. Fed. Mal. St. Mus. VIII (1917), 107; J. J. S. Ic. Orch. Mal. I (1930), t. 41, II.

Planta valida, elata. Folia longe petiolata, lanceolata, acute acuminata, basi sensim in petiolum angustata, glabra, nervis c. 7 majoribus subtus prominentibus, sicco membranacea, c. 23—64 cm longa, 7.5—12.75 cm lata; petiolus canaliculatus, costatus, cum vagina c. 10—34 cm longus; vaginae ad basin innovationum ad c. 38 cm longae. Inflorescentiae validae, erectae, laxius multiflorae, pedunculo dense sicco atrofusce puberulo, c. 57—110 cm longo, vaginulis c. 4 acuminatis puberulis ad c. 3—5.5 cm longis donato, rachide dense sicco atrofusce velutino-puberula, ad c. 9—20 cm longa. Bractee conspicuae, arcuato-recurvae, e basi ovato-lanceolata sensim longe angustatae, acutae, canaliculato-concavae, leviter undulatae, puberulae, ad c. 2.75—5 cm longae, basi 1 cm latae. Flores majusculi, sepalis dorso dense intus ad basin parce puberulis. Sepalum dorsale oblongo- ad obovato-ellipticum, breviter acuminatum, 3- supra basin 5-nervium, c. 1.6 ad fere 2 cm longum, 0.64—1.1 cm latum. Sepala lateralibus oblique oblongo-elliptica ad obovata, apice obtuse canaliculato-apiculata, 3- supra basin 5-nervia, c. 1.7—2 cm longa, 0.7—1.1 cm lata. Petala oblique rhombo-lanceolata vel plus minusve rhombo-spathulata, apice angustata vel plus minusve contracta, apiculata, intus extusque parce puberula, 3-nervia, costa media dorso sulcata, c. 1.5—1.75 cm longa, 0.7—0.8 cm lata. Labellum basi gynostemio tota longitudine adnatum, calcaratum, subtus sulcatum, parte gynostemio adnata canaliculata, puberula, intus hirtella, c. 0.75—1.1 cm longa, lamina alte tripartita, callo conspicuo antice bipartito introrsum verrucoso postice parce puberulo cum serie aequilonga verrucarum interposita ad basin inter lobos laterales, explanata c. 1.65—1.95 cm longa, ad lobos laterales c. 2.1—2.8 cm lata, lobis lateralibus basilaribus, patentissimis, oblique oblongis, obtusis, c. 0.95—1.2 cm longis, 0.4—0.45 cm latis, lobo intermedio cuneato, ad medium vel ad 1/3 partem infra apicem bifido, basi minute transverse ruguloso et parce puberulo, c. 1.4—1.65 cm longo, basi 0.4 cm, apice 1.1—1.25 cm lato, lobulis sinu acutangulo sejunctis, oblique oblongis, rotundato-truncatis crenulatisque, 0.4—0.5 cm latis, calcar ovario parallelo, arcuato, tereti, obtuso, basi non ampliato, puberulo, c. 2.5—3.2 cm longo. Gynostemium tota longitudine labello adnatum, oblique obconicum, marginibus inferioribus leviter curvulum, dorso lateribusque convexum, subtus alte canaliculatum, 3-lobulum, puberulum, c. 0.75—1 cm longum, lobulo apicali rotundato, clinandrio alte excavato, suborbiculari cum costula longitudinali, lobulis stigmaticis antheram bene superantibus, obliquis, margine anteo obtusangulis, carnosus, stigmatis alte excavatis,

orbicularibus. Anthera alte cucullata, late ovata cum costula longitudinali, late membranaceo-marginata, acuta, c. 0.23 cm lata. Pollinia 8, clavata. Rostellum alte excisum, sinu obovato-oblongo, lobis margine interiore apiculatis. Ovarium trigono-teres, 6-sulcatum, dense puberulum, c. 1.2—1.6 cm longum; pedicellus teres, dense puberulus, 3—4.1 cm longus.

Sumatra: Westcoast, Kerintji Peak, 2300—2400 m, in forest, common. (*H. C. Robinson* and *C. Boden Kloss*; *H. A. B. Binnemeijer nrs. 9895 pp.* and *10469 pp.*, May 1920). Pondok Boenga, 3000 m. (*A. Frey-Wyssling*, July 1931).

Geographical distribution: Endemic.

Though Mr Ridley says that there is no callus on the lip, I think this is *C. longibracteata* Ridl. In the material quoted above there is a conspicuous callus at the base of the lip blade between the side lobes, exactly as in the allied species, only the rows of warts are not produced on the base of the midlobe. The specimen described by Ridley was apparently a small one.

I am in doubt with regard to the colour of the flowers, different species being mixed together under the same number.

In *C. crumenata* Ridl. and *C. transiens* J. J. S. the bracts are too much elongated.

Description from herbarium and flowers preserved in alcohol.

Acanthophippium eburneum Krzl. in *Gard. Chron.* 1896, II, 266; J. J. S. *Ic. Orch. Mal.* I (1930), t. 44, I.

Pseudobulbi approximati, erecti, elongato-conici, angulati, c. 4-nodi, atrovirides, c. 6 cm longi, pluribus vaginis tubulosis valde angulatis acutis sordide viridibus sursum accrescentibus ad c. 14 cm longis tecti, apice 2-folii. Folia erecta, recurva, oblongo-elliptica, sensim acuminata, acutissima, basi sensim in petiolum angustata, longitudinaliter plicata, nervis 5 supra sulcatis subtus acute carinatis, membranacea, nitide viridia, c. 32—40 cm longa, 10—12 cm lata; petiolus brevis, latus, canaliculatus, 3-carinatus, cum vagina tubulosa valde quadriquetra opaca sordide viridi c. 11—16.5 cm longus. Inflorescentia ex axilla vaginae intermediae, erecta, brevis, c. 4-flora, pedunculo pseudobulbo adpresso, subtereti, olivaceo, c. 1.25 cm longo, rachide flexuosa, angulata, olivacea, c. 1.5 cm longa. Bracteae magnae, adpressae, rachidem semiamplectentes, triangulae, subacuminatae, apice incurvulae, acutae, valde concavae, pallidae, purpureo-suffusae, c. 3.2 cm longae, 2.3 cm latae, superiores minores. Flores quaquaversi, mediocres, anguste et oblique urceolati sepalis sulcis separatis a latere visi parallelogrammiformes, eburnei, apicem versus flavescentes, subsemipellucidi, carnosuli, sepalis lateralibus dimidiis proximis pallide flavis, c. 4.5 cm longi, 2.7 cm lati. Sepalum dorsale longitudine c. 2 cm sepalis lateralibus agglutinatum, oblongum, apice rotundatum, subrectum, concavum, praesertim intus nitidum, basi intus parce purpureo-punctatum, c. 3.3 cm longum, 1.2 cm latum. Sepala lateralialia lacinia oblique triangula concava ad pedem gynostemii decurrentia, mentum reversum cum ovario angulum acutum faciens angustum calcariforme oblongum apice breviter incurvulum obtusum c. 1.45 cm longum formantia, oblongo-parallelogrammiformia, apice oblique recurva, obtusa, concava, extus obtusangule convexa, 5-nervia, utrinque nitidula, dimidio inferiore intus purpureo-punctata, usque ad apicem ovarii c. 3.2 cm, tota 4.5 cm longa, 1.6 cm lata, parte pedi gynostemii adnata c. 1.7 cm longa. Petala parallela,

oblique spathulata, basi obliqua, intus fascia longitudinali angulato-convexa, dorso sulcata, 3-nervia, carnosa, utrinque nitida eburnea, basi intus purpureo-puncticulata, tota c. 3.1 cm longa, ungue oblique oblongo, apice in laminam dilatato, c. 0.9 cm longo, medio 0.45 cm lato, lamina oblique oblongo-triangulara, apicem versus sensim angustata, obtusa, angulis basilaribus obtusangule rotundata, c. 2.2 cm longa, 0.95 cm lata. Labellum parvum, pedi gynostemii subelastice insertum, curvatum, canaliculatum, subtrilobum, subtus longitudinaliter sulcatum, costis 3 longitudinalibus obtusangulis, costa intermedia e basi usque ad apicem, 2 exterioribus in $1/3$ — $2/5$ partibus supra basin evanescentibus, costula valde obsoleta utrinque addita, extus nitidum, fascia lata mediana praesertim basin versus crasse carnosa citrina basin versus albida, parte antica rugulosa, inexplanatum c. 1.6 cm longum, subexplanatum 1.8 cm longum, 1.4 cm latum, ambitu triangulum, ungue brevi, transverse quadrangulo, c. 0.73 cm lato, lobis lateralibus erectis, oblique subtriangulis, postice obtusis, margine antico leviter rotundatis, tenuibus, lobo intermedio sinibus subobsoletis a lobis lateralibus sejuncto, semiovali, obtuso, citrino, fere 0.8 cm longo, 0.9 cm lato. Gynostemium rectum, basi contractum, ceraceo-album, nitidum, c. 1.3 cm longum, superne bene 0.7 cm latum, clinandrio alte excavato cum dente conico, 3-lobo, apice aequilateraliter trapeziformi, truncato, auriculis late triangulis, subrotundato-obtusis. Anthera cucullata, oblique conica, basi in gibbum contracta, apice in rostrum triangulum acutum producta, margine utrinque medio recurvo, alba, c. 0.35 cm lata. Pollinia 8, valde inaequimagna, lateraliter compressa, extus convexa, flava, opaca, 4 minora breviter quadrangula, 4 majora minora multo superantia, lanceolata, c. 0.5 cm longa. Rostellum breve, latum, truncatum. Stigma magnum, obovatum. Pes gynostemii maximus, reversus, cum ovario angulum acutum faciens, ante medium abrupte acutangule incurvus, parte inferiore sepalis lateralibus adnata, recta, apice incurva, lineari apicem versus leviter angustata, dorso apicem versus canaliculata, intus ad basin alba, superne aurea, dorso ad basin purpurea, apicem versus pallide flava, c. 1.5 cm longa, parte antica gynostemio parallela, leviter undata, lineari, superne leviter subspathulato-dilatata, canaliculata, superne subplana, subtus convexa cum sulco longitudinali, apice truncata, nitidula, aurea, c. 2.3 cm longa, 0.5 cm lata. Ovarium pedicellatum validum, tortum, teres, 6-sulcatum, apice obliquum, violaceo-purpureum, basin versus pallidius et submarmoratum, c. 2.8 cm longum.

Sumatra: Deli, Habako. (*W. M. Docters van Leeuwen*, March 1919, liv. pl. cult. in *Hort. Bog.* sub n. 91).

Geographical distribution: Endemic.

I have no doubt that this is the plant intended by Prof. Kränzlin, though I have not seen the 3 elevated lines on the apex of the column foot mentioned by Kränzlin.

In the note l.c. Kränzlin says that there is a single sharp triangular line between the side lobes of the lip; in the description, however, he mentions 2 more inconspicuous ribs. In the material I studied there is one distinct central ridge, 2 far less distinct and much shorter ribs, and traces of a fourth and fifth elevated line.

Description from a few living specimens.

Eria (sect. *Bryobium*) **lasiorrhiza** Schltr. in Engl. Bot. Jahrb. XLV (1911), Beibl. No. 104, 46; in Fedde Rep. Beih. LXXIV (1934), t. 43, Nr. 171; Krzl. in Pflanzenr. IV. 50. II. B. 21 (1911), 166.

var. **unifolia** J. J. S. n. var.

Pusilla. Rhizoma repens, breve, radicibus hic illic longe pilosis. Pseudobulbi approximati, depresso subglobosi, uno latere excisi, carnosi, c. 0.3 cm alti, 0.7 cm diam., 1-folii, nonnullis vaginulis basi tubulosis apice recurvis triangulis acutis minute crenulatis superioribus accrescentibus ad c. 0.8 cm longis ad basin. Folium erectum, elliptico-spathulatum, apice breviter abrupte acute acuminatum minuteque crenulatum ad denticulatum, basin versus sensim conduplicato-angustatum, costa media supra sulcata subtus carinata, c. 7-nervium, tenue, c. 2.4—3.1 cm longum, 0.775—1.2 cm latum; vagina tubulosa, compressa, basi laminae angustior, supra pseudobulbum c. 0.5 cm longa. Inflorescentia singula, folium superans, laxe pauciflora, pedunculo tenui, angulato, celluloso-papillosa, c. 3—5 cm longo, rachide quaquaverse flexuosa, angulata, asperulo-papillosa fere muriculata, c. 0.7—1.5 cm longa. Bractee persistentes, patentes, ovatae, acuminatae, concavae, carinatae, dorso margineque papilloso-verruculosae, 1-nerviae, c. 0.325 cm longae, 0.23 cm latae. Flores quaquaversi, c. 3—5, parvi, c. 0.375 cm longi, sepalis petalisque conniventibus. Sepalum dorsale ovarium continuum, horizontale, incurvulum, valde concavum, ovali-oblongum, apice subrotundatum, abrupte apiculatum, 3-nervium, costa media dorso prominula minuteque papillosa, c. 0.375 cm longum, 0.2 cm latum. Sepala lateralia cum pede gynostemii mentum conicum cum ovario angulum obtusum faciens incurvulum obtusum fere 0.2 cm longum formantia, margine antico supra basin satis conspicue incurvo, supra basin leviter oblique dilatatum oblique subovato-triangua, acute subulato-acuminata, concava, 3-nervia, costa media dorso conspicue prominente minuteque erosula, c. 0.37 cm longa, fere 0.25 cm lata. Petala porrecta, parallela, gynostemio adpressa, verticalia, oblique oblonga, obtuse acutata, glabra, 3-nervia, c. 0.25 cm longa, 0.1 cm lata. Labellum mobile, membrana parva pedi gynostemii insertum, simplex, curvatum, canaliculatum, subtus longitudinaliter sulcatum, inexplanatum oblongum, apice acute acutatum, basi truncatum, intus margineque minutissime papillosum, fere 0.2 cm longum. Gynostemium breve, apice conspicue producto dorso convexo subtus concavo rotundato-quadrangulo cum apiculo triangulo, cum anthera bene 0.1 cm longum, auriculis brevissime dentiformibus. Anthera alte cucullata, apice in lobulos 2 obtusos sinu lato separatos producta, 0.06 cm lata. Pollinia 8, 4 oblique cuneato-triangua, 4 anguste oblonga. Stigma suborbiculare. Pes gynostemii cum ovario angulum obtusum faciens, incurvulus, linearis, truncatus, vix canaliculatus, fere 0.2 cm longus. Ovarium crasse obconicum, subtus planum, lateribus convexis, c. 0.2 cm longum; pedicellus tenuior, c. 0.06 cm longus. Capsula immatura flore marcido coronata, obovoidea, breviter pedicellata.

Sumatra: Bataklanden, Saddle of the Asahan-breach, c. 1100 m, ravines in forest, epiphytcal on stumps, not rare. (*J. A. Lörzing n. 10044*, May 1923; "flowers red-brown").

Geographical distribution: Endemic; the *type* (*R. Schlechter n. 15933*) also in *Sumatra*.

This differs from Schlechter's description and figure of the *type* by

the denser, one-leaved pseudobulbs and the acute, in front not widened lip.

Description from herbarium and material preserved in alcohol.

Eria (sect. *Mycaranthes*) **rhinoceros** Ridl. in Journ. Fed. Mal. States Mus. VIII (1917), 99; J. J. S. Ic. Orch. Mal. I (1934), t. 53, IV.

Caules elongati, foliati, partes adsunt ad 49 cm longae, internodiis c. 3—4 cm longis. Folia patentia, linearia, apicem versus sensim angustata, valde oblique acuta vel obtusiuscula vel plus minusve bidentata, basi canaliculata, costa medio sicco dorso prominente, ad c. 21 cm longa, sicco 1.4 cm lata; vaginae tubulosae, internodium multo superantes. Inflorescentiae ad nodos caulium in excavationibus sitae, patentes, laxae multiflorae, pedunculo dense incano-lanato-villosulo, ad c. 4 cm longo, nonnullis vaginulis conspicuis latis base utrinque sublanatis ceterum plus minusve puberulis ad c. 1.5 cm longis donato, rachide dense incano-lanata, ad c. 20 cm longa. Bractaeae conspicuae, reflexae, oblongo-ovatae, acutae, concavae, utrinque parae hirtello-puberulae, c. 1.4 cm longae, 0.5 cm latae, superiores decrescentes. Flores quaquaversi, in sectione majusculi, valde aperti, c. 1.25 cm lati, sepalis dorso incano-stellato-sublanatis. Sepalum dorsale recurvum, ovatum, obtusum, valde concavum, 3-nerviū, c. 0.6 cm longum, 0.375 cm latum. Sepala lateralalia subrecurva, late oblique triangula, obtusa, concava, 5-nervia, c. 0.6 cm longa, basi 0.5 cm lata. Petala oblique ovato-rhombea, obtusa, leviter convexa, subirregulariter marginata, glabra, 3-nervia, tenuia, c. 0.57 cm longa, 0.325 cm lata. Labellum porrectum, leviter adscendens, superne obtusangule recurvum, 3-lobum, breviter unguiculatum, callis 3 farinosis ad basin callis exterioribus subglobosis, intermedio multo altiore, erecto, anguste oblongo-conico, 3-costatum, costa intermedia convexa, farinosa, inter lobos laterales sensim constricta, deinde dilatata, in medio lobi intermedii in callum magnum erectum oblongum trigonum obtusum lobos lateralibus aequaltum acuta, costis exterioribus superne leviter divergentibus et altioribus, ad basin lobi intermedii abrupte obtuse terminantibus et brevissime liberis, labellum explanatum c. 0.625 cm longum, ad lobos laterales fere 0.8 cm latum, ungue cuneato-quadrangulo, c. 0.16 cm longo; lobi laterales adscendentes, patentissimi, oblique subtrianguli-oblongi, obtusi, convexi, c. 0.22 cm longi, 0.16 cm lati; lobus intermedius conspicuus, recurvus, convexus, undulatus, e basi satis angusta valde dilatata, subsessilis, transverse quadrangulo-oblongus, apice lato subtruncato repandus, retusus, convexus, c. 0.3 cm longus, 0.65 cm latus. Gynostemium brevissimum, cum ovario angulum obtusum fere rectum faciens, latius quam longum, paulum a dorso compressum, dorso convexum, apice truncatum, usque ad rostellii apicem c. 0.16 cm longum, clinandrio transverse ovali, concavo cum costula longitudinali. Anthera cucullata, reniformis, lobis oblique rotundatis, connectivo obtuse gibboso, c. 0.17 cm lata. Pollinia 8, breviter pyriformia. Rostellum breve, transverse subquadrangulum, obtusum. Stigma transverse subquinquangulare. Pes gynostemii cum ovario angulum rectum faciens, rectus, linearis, truncatus, leviter convexus, basi canaliculatus, c. 0.3 cm longus. Ovarium pedicellatum subclavatum, incano-sublanatum, c. 0.7 cm longum.

Sumatra: Peak of Kerintji, 2300 m. (*H. C. Robinson* and *C. Boden Kloss*). Ophir districts, Goenoeng Talamau (Ophir), northwestern slope, 1850 m. (*H. A. B. Bünne-meijer* n. 716, May 1917). Goenoeng Talang, Laras Talang, 2200 m, forest. (*H. A. B. Bünne-meijer* n. 5382, November 1918, sterile).

Geographical distribution: Endemic.

A most remarkable species of the section *Mycaranthes*. The flowers are typical *Mycaranthes*-flowers with very large calli on the lip, but the inflorescences are not pseudoterminal but lateral as in *Cylindrolobus* and *Trichotosia*. The bracts are uncommonly large in the section. Unfortunately the tips of the stems were only collected; according to the informations of the collector they should, however, attain a considerable length.

In some respects the plant recalls to mind *E. Forbesiana* Kränzl., which is, however, described from very incomplete materials and seems to have 3 pseudoterminal inflorescences.

The flowers are said to be yellow and violet inside.

Description from herbarium and part of an inflorescence preserved in alcohol.

My description was drawn up before I had seen the publication cited above. Accidentally I had chosen the same specific name.

Eria (sect. *Cylindrolobus*) **graminea** Ridl. in Journ. Fed. Mal. St. Mus. VIII (1917), 103.

Caules approximati, elongati, tenues, c. 30—65 cm longi, internodiis c. 2—2.5 cm longis. Folia patentia, linearia, apicem versus angustata et saepissime valde inaequaliter bidentata, sicco coriacea, c. 6.5—11 cm longa, sicco 0.5—1 cm lata, dente longissimo c. 2—3 cm longo; vaginae tubulosae, internodia subaequantes. Inflorescentiae in excavationibus caulis sitae, vaginam dorso ad basin perforantes, patentissimae, brevissimae, 1-florae, pedunculo cum rachide c. 0.6 cm longo. Bractae c. 4, sessiles, ovatae, sensim acuminatae, c. 0.75 cm longae, 0.3 cm latae et majores. Flos mediocris, sepalis dorso parce furfuraceo-punctatis petalisque conniventibus curvatis. Sepalum dorsale incurvum, anguste oblongum, apicem versus angustatum, obtusum, concavum, c. 7(—9)-nervium, c. 1.75 cm longum, 0.6 cm latum. Sepala lateralia cum pede gynostemii mentum breve obtusum formantia, oblique triangula, obtusangule falcata, acutiuscula, concava, c. 7(—9)-nervia, 1.43 cm longa, 0.65 cm lata. Petala oblique oblonga, falcata, obtusa, leviter concava, basi 3-nervia, nervis exterioribus ramosis, c. 0.4 cm longa, 0.5 cm lata. Labellum cum pede gynostemii angulum acutum faciens, recurvum, concavum, subsimplex, in 3/5 partibus supra basin constrictum, costis 3 longitudinalibus inferne inconspicuis et praesertim intermedia papillosis, costa intermedia usque ad medium lobi intermedii producta, in lobo medio crassiore, costis exterioribus, ad basin lobi intermedii terminantibus, apice altioribus et oblique bidentatis, explanatum oblongum, fere 1.1 cm longum, hypochylio quadrangulo, basi truncato et utrinque rotundato-lobulato, c. 0.65 cm longo, 0.6 cm lato, epichylio (lobo intermedio) transverse ovali, apice late rotundato cum lobulo rotundato in medio, basi utrinque paucicrenato, c. 0.4 cm longo, 0.625 cm lato. Gynostemium subrectum, a dorso compressum, dorso convexum, c. 0.5 cm longum, clinandrio transverse ovali, excavato, auriculis tenuibus, late rotundatis concavis. Anthera cucullata, ambitu bene semiorbicularis, apice incurvo rotundata, connectivo conspicuo convexo ovato-orbiculari, c. 0.175 cm lata. Pollinia 8, compressa, orbiculari-obovata ad obovata, 0.08 cm longa. Stigma transverse ovale, subreniforme. Pes gynostemii cum ovario angulum subrectum faciens, late oblongo-

quadrangulus, leviter convexus, c. 0.4 cm longus. Ovarium 6-sulcatum, c. 1.3 cm longum. Capsula elongata, c. 2.5—6 cm longa.

Sumatra: Westcoast, west side of Barisan Range, Barong Baroe, 1300 m. (H. C. Robinson and C. Boden Kloss, without number and date). Peak of Kerintji, 1400—2200 m, epiphytical in forest. (H. A. B. Bünnemeijer nrs. 8443, 8538, 9348, 9375, 9411, 9523, 9575, March—April 1920).

Geographical distribution: Endemic.

This species is very closely allied to *E. cyrtosepala* Schltr. It differs in the thinner stems, narrower leaves, and the keels of the lip being very inconspicuous on the basal half.

The flowers are said to be white or white with a yellow or a yellowish green lip.

Description from herbarium and flowers preserved in alcohol.

Eria (sect. *Cylindrolobus*)? **erythrosticta** Ridl. in Journ. Fed. Mal. St. Mus. VIII (1917), 102; J. J. S. Ic. Orch. Mal. I (1934), t. 56, IV.

Habitus omnino *E. compressae* Lndl. Caules validi, elongati, parte adest ad c. 48 cm longa, internodiis c. 3.5—4 cm longis. Folia patentia, anguste lanceolata, inaequilatera, sensim valde oblique et anguste acuminata, nervis c. 7—9 sicco prominentibus, sicco tuberculata, ad c. 20—21 cm longa, 1.6—2.1 cm lata; vaginae tubulosae, internodia superantes, apice truncatae. Inflorescentiae in excavationibus caulium, 2 vaginas perforantes, racemosae, c. 3—7-florae, pedunculo c. 1.7—2 cm longo, cum rachide c. 0.4—1.2 cm longa stellato-furfuraceo. Bractae patentissimae vel reflexae, convexae, ovatae, sensim acuminatae, carnosulae. Flores erecti, majusculi, sepalis dorso sparse minute stellato-furfuraceis. Sepalum dorsale incurvum, lineare, apice vix contractum, obtusum, concavum, supra basin 5-nervium, c. 1.675 cm longum, 0.425 cm latum. Sepala lateralibus cum pede gynostemii mentum breve rectum obtusum facientia, oblique oblonga, falcata, obtusa, basi leviter dilatata, valde concava, c. 1.25 cm longa, basi 0.6 cm lata. Petala lanceolato-linearibus, falcata, apicem versus leviter dilatata, apice breviter contracta, anguste obtusa, concava, dorso ad basin parce minute stellato-furfuracea, 3-nervia, costa media dorso sulcata, c. 1.45 cm longa, 0.34 cm lata. Labellum recurvum, 3-lobum, 3-costatum, costa media e basi fere usque ad apicem producta, recta, in lobo intermedio valde incrassata et elevata, omnino dense patentissime villosa, a costis lateralibus non obtecta, costis exterioribus latioribus, inter lobos laterales obsolete marginatis, glabris, ad basin lobi intermedii in callum obtusum abrupte terminantibus, fasciculo pilorum rotundo parvo ad basin in utraque parte costae mediae, 3-nervium, nervis exterioribus valde ramosis, costa media subtus sulcata, inexplanatum c. 0.75 cm longum, explanatum 0.86 cm, usque ad apicem loborum lateralium 0.73 cm longum, 0.83 cm latum; lobi laterales porrecti, incurvi, gynostemium amplectentes, oblique oblongi, falcatulii, obtusi, c. 0.27 cm longi, basi 0.22 cm lati; lobus intermedius recurvus, praesertim parte mediana concavus, explanatus ambitu semiorbiculari-quinquangularis, apice obtuse contractus, apice excepto repandulo-crenulatus, c. 0.35 cm longus, 0.55 cm latus. Gynostemium curvulum, dorso convexum, sectione transversa triangulum, subtus concavum, apice (clinandrio) contractum, c. 0.6 cm longum, clinandrio parvo, angusto, excavato, auriculis parallelis, quadrangulis, apicem versus angustatis,

subtruncatis, concavis. Anthera cucullata, subovata vel potius subsemi-oblonga, apice rotundata, basi truncato-bilobula, a latere visa triangula, connectivo crasse carinata, c. 0.175 cm longa. Pollinia oblonga, a latere compressa, c. 0.15 cm longa. Stigma cordatum. Pes gynostemii cum ovario angulum acutum faciens, rectus, apice tantum incurvulus, quadrangulus, infra apicem callo reverso anguste conico papilloso instructus, c. 0.3 cm longus. Ovarium 6-sulcatum, praesertim in sulcis stellato-furfuraceum, c. 2.3 cm longum.

Sumatra: Westcoast, Soengei Koembang, 1300—1700 m. (*H. C. Robinson* and *C. Boden Kloss*, without number and date). Kerintji Peak, 1600 m, in forest. (*H. A. B. Bünnemeijer* n. 8454, March 1920; "flowers tawny orange-yellow, with bloodred dots").

Geographical distribution: Endemic.

Though Ridley's descriptions of *E. erythrosticta* Ridl. and *E. pinguis* Ridl. are inadequate to get a clear idea of what he meant and I have seen no specimens, I suppose that my identifications are correct.

Both plants are most nearly allied to *E. compressa* Bl. from Java. They agree in habit and the colour and general shape of the flowers. They may be distinguished at the first sight from the Javanese species by the much larger flowers. Both Sumatran species as well as *E. compressa* Bl. var. *sumatrana* J. J. S. differ from the Javanese one in the midlobe of the lip being larger and not bilobed.

In *E. compressa*, *E. c.* var. *sumatrana* and *E. erythrosticta* the central keel of the lip is shortly and densely hairy but in *E. pinguis* the hairs are much longer in the basal part. The outer keels are very conspicuous in *E. pinguis* and touch each other partly, thus concealing part of the middle one. In *E. compressa* var. *sumatrana* and *E. erythrosticta* there are to be found small cushions of hairs at the base of the outer keels, which are lacking in the other species.

In *E. pinguis* the lip and especially the midlobe are much broader than in the other forms and the margin of the midlobe is coarse-crenate except in the centre. In this species the column is really winged towards the base. Moreover the side lobes are here densely puberulous on the back side.

The column foot has a low blunt callus in *E. compressa* and *E. pinguis* and a subulate one in *E. compressa* var. *sumatrana* and *E. erythrosticta*.

Description from a dried specimen and an inflorescence preserved in alcohol.

Eria (sect. *Cylindrolobus*)? *pinguis* Ridl. in Journ. Fed. Mal. St. Mus. VIII (1917), 103; J. J. S. Ic. Orch. Mal. I (1934), t. 57, I.

Habitus omnino *E. compressae* Lndl. Caules validi, parte adest ad c. 4.7 cm longa, internodiis c. 2.5—3 cm longis. Folia patentia, lineari-lanceolata, inaequilatera, apicem versus angustata, valde inaequaliter et anguste bidentata, sicco coriacea, tuberculata, c. 12—17 cm longa, 2.3—3.2 cm lata; vaginae tubulosae, internodia superantes, apice truncatae. Inflorescentiae in excavationibus caulium sitae, vaginas 2 perforantes, c. 3—6-florae, pedunculo cum rachide c. 6.5—8 cm longo, parce adpresse furfuraceae stellato-piloso. Bractae oblongo-ovatae, acuminatae, convexae, ad c. 1.3 cm longae, 0.53 cm latae. Flores majusculi, sepalis intus dense papillois, dorso sparse adpresse stellato-furfuraceis. Sepalum dorsale

oblongum, antice vix dilatatum, apice angustatum, anguste obtusum, praesertim superne concavum, 3-nervium, fere 1.6 cm longum, basi 0.5 cm, superne 0.64 cm latum. Sepala lateralia basi excavata basin labelli amplexentia, oblique ovali-ovata, falcata, obtusa, minute obtuse apiculata, concava, 3-nervia, c. 1.25 cm longa, medio 0.8 cm lata. Petala anguste oblonga, obtusangule falcata, obtusa, utrinque dense papillosa et dorso parce adpresse stellato-furfuracea, 3-nervia, costa media dorso sulcata, c. 1.4 cm longa, 0.5 cm lata. Labellum supra basin valde recurvum, 3-lobum, 3-costatum, costa intermedia e basi fere usque ad apicem producta, inferne longe pilosa ceterum dense velutina, in flexu costis lateralibus obtecta, in lobo intermedio maxima et crenato-repanda, costis lateralibus basi angustis superne valde incrassatis dorso latis subplanis leviter concavis, apice divergentibus et ad basin lobi intermediarii abrupte terminantibus, glabris, 3-nervium, nervis exterioribus valde ramosis, explanatum ambitu transverse sexangulato-ellipticum, basi truncatum, c. 0.9 cm longum, 1.4 cm latum; lobi laterales erecti, oblique oblongi, falcatuli, obtusi, dorso dense puberuli, c. 0.425 cm longi, medio 0.26 cm lati; lobus intermedius magnus, explanatus transversus, aequilaturaliter trapeziformis, subtrilobulus, c. 0.46 cm longus, 0.775 cm latus, parte mediana valde cucullata, antice rotundata, partibus lateralibus undulatis irregulariter lacerato-crenatis. Gynostemium majusculum, curvum, oblique conicum, dorso convexum, marginibus basin versus alato-dilatatis parallelisque subtus excavato-concavum, apice (clinandrio) longitudine c. 0.2 cm contractum, c. 0.8 cm longum, clinandrio concavo, auriculis parallelis, oblongis, rotundatis, erosulis, concavis, extus convexis. Anthera cucullata, auriculas paulum superans, oblonga, obtusa, basi bilobo-truncata, connectivo carinata, c. 0.23 cm longa. Stigma obverse triangulum. Pes gynostemii cum ovario angulum subrectum faciens, rectus, oblongus, truncatus, inferne marginibus gynostemii decurrentibus alatus, intus papillosus et infra apicem callo breviter conico papilloso instructus, c. 0.4 cm longus. Ovarium 6-sulcatum, praesertim in sulcis stellato-puberulum, c. 1.9 cm longum.

Sumatra: Westcoast, west side of Barisan Range, Barong Baroe, 1300 m. (*H. C. Robinson* and *C. Boden Kloss* n. 136). Kerintji Peak 1700—2100 m, in forest. (*H. A. B. Bunnemeijer* nrs. 9099, 9374, 9417, 9494, March—April 1920; "flowers dotted red inside, labellum white").

Geographical distribution: Endemic.

Under *E. erythrosticta* Ridl. I have given the differences with the allied species.

Description from herbarium and flowers preserved in alcohol.

The section *Aporodes* Schltr. of *Eria* Lndl.

The section *Aporodes* Schltr. of *Eria* was in 1911 based by R. Schlechter (in Fedde Rep. X (1911), 85) on a few nearly related species, which in habit and the equitant laterally compressed leaves closely resemble the section *Aporum* of *Dendrobium* Sw. but in the inflorescences and flowers possess all the characters of the section *Cylindrolobus* of *Eria* Lndl. The likeness of the species, the apparently often incomplete material in the collections and the inadequate descriptions, partly due to the tender ephemeral flowers have led to much confusion in the nomenclature.

The number of species for the present amounts to four. Schlechter notes (Orch. D. N. Guinea (1912), 671) that the plants grow in the mangrove-formation which fact admonishes to prudence, but Oakes Ames says (in Merrill, Enumeration Phil. pl. (1925), 345) that *Eria aporoides* Lndl. occurs in the Philippine Islands at sea level up to 1000 m altitude.

Although it is not possible for the time being to give a definite survey over the group, I intend to make some remarks.

1. *Eria incrassata* (Brongn.) Schltr. in Fedde Rep. XXI (1925), 165. — *Aporum incrassatum* Brongn. in Duperrey Voy. Coquille (1834), 204; Atlas (1826), t. 42 B. — *Dendrobium Brongniartii* Krzl. (pp. ?) in Pflanzenr. IV. 50. II. B. 21 (1910), 210 (excl. syn. *Eria aporoides* Lndl.); Ames (pp. ?) in Phil. Journ. Sc. VII (1912), Bot. 15; Orch. V (1915), 116.

This was the first species of the group which became known to science. It was described and figured by A. Brongniart, who, probably misled by the shape of the leaves, placed it in Blume's genus *Aporum* (now *Dendrobium*), and overlooked the fact that Blume had already created a species *incrassatum*. The description of the species is missing in the copies of the book both in the library of the Rijksherbarium at Leiden and in the University Library; according to Oakes Ames' enumeration of the Philippine *Orchidaceae* it was published in 1834, p. 204. From the title page of the Atlas it is proved that this appeared in 1826. In the case t. 428 is correct *E. incrassata* differs from the allied species in the dorsal sepal being much shorter than (nearly half so long as) the lateral ones. Moreover the lip is depicted with a long linear claw, which no doubt actually is the column foot; it is 3-lobed, the lobes being separated by shallow bights. The sidelobes are semi-orbicular, not produced in front into a distinct lobe, and the midlobe is more or less triangular and blunt. I find no annotations from which it appears whether the lip is wholly glabrous or not.

In the supposition that it was a *Dendrobium* Kränzlin, when transferring it to that genus, named it *D. Brongniartii* Krzl.; he could not apply the specific name *incrassatum* on account of *Aporum incrassatum* Bl., which is a true *Dendrobium*. Finally Schlechter placed it correctly in *Eria* under the name *E. incrassata* (Brongn.) Schltr.

For the present there is no reason to accept that *E. incrassata* (Brongn.) Schltr. should be considered conspecific with *E. aporoides* Lndl.

2. *Eria aporoides* Lndl. in Journ. Linn. Soc. III (1859), 60; Miq. Fl. Ind. Bat. III (1859), 657; Naves Nov. App. (1882), 236; Merr. in Govt. Lab. Publ. Phil. XXVII (1905), 84. — *Epidendrum equitans* Blanco Fl. Philipp. (1837), 645; ed. 2 (1845), 449; ed. 3, III (1879), 44. — *Dendrobium aporoides* (Lndl.) Merr. Sp. Blancoanae (1918), 113; Ames in Merr. Enum. Phil. pl. (1925), 345. — *Pinalia aporodes* O. K. Rev. gen. pl. II (1891), 678. Philippine Islands: Luzon, Leyte, Basilan, Mindanao.

Geographical distribution: Endemic.

Lindley's original description runs as follows:

"*Eria aporoides*: foliis brevibus obtusis acinaciformibus equitantibus, pedunculis unifloris bracteis linearibus obtusis carnosus, floribus glabris, sepalis petalisque ovatis obtusis, labello acute 3-lobo, lobo intermedio majore carnosus. Philippine Islands, Cuming.

This has much the appearance of the plant figured by A. Brongniart as *Aporum incrassatum* (Duperrey, t. 42 B), but the lip is 3-lobed not entire."

It is to be remarked that Lindley simply states that the flowers are glabrous, but not manifestly says that this is also the case with the lip, which he describes as "acute trilobum".

At my request Prof. Ames most kindly sent me good material of *Eria aporoides* Lndl. from the Philippine Islands. A fresh description I insert here.

***Eria aporoides* Lndl.**

Rhizoma elongatum, repens, radicans, teres, siccum c. 0.3 cm diam. Caules c. 4 cm dissiti, simplices, compressi, omnino foliati, 24—35 cm longi, cum foliis 2.5—3 cm lati, internodiis 0.7—1.2 cm longis. Folia alternatim bifaria, articulata, equitantia, valde a latere compressa, oblongo-triangularia, acutiuscula vel obtusiuscula, basi subrotundata, supra inferne 3/5 ad 1/2 longitudinis vaginato-fissa, carnosa, margine superiore 1.5—2.4 cm, dorso 1.5—2.65 cm longa, basi 0.65—1.1 cm lata; vaginae caulem omnino obtegentes, tubulosae, valde a latere compressae, apice angulatae, internodia superantes. Inflorescentiae axillares, vaginam basi perforantes, brevissimae, 1-florae, bracteis c. 4 ovato-triangulari-lanceolatis acutis donatae. Flos mediocris. Sepalum dorsale anguste oblongum, obtusum, 3—5-nerviis, 1.3 cm longum, 0.375 cm latum. Sepala lateralibus ad pedem gynostemii decurrentia, mentum breve obtusum formantia, oblique oblonga, anguste obtusa, margine anteriore fere 1/2 inferiore paulum dilatata, 3—5-nervia, c. 1.2 cm longa, basi rotundata fere 0.5 cm, medio 0.35 cm lata. Petala oblique oblonga, basi subspathulato-contracta, apice obtusa, 3-nervia, 1.16 cm longa, 0.37 cm lata. Labellum 3-lobum, inter lobos laterales 3-costatum, costis ut videtur minutissime papillois, intermedia superne dense puberula, expansum totum 0.95 cm, usque ad apicem loborum lateralium 0.7 cm longum, 0.6 cm latum; lobi laterales erecti, antice producti, porrecti, trianguli, obtusi, 0.16 cm longi, 0.18 cm lati; lobus intermedius cum lobis lateralibus angulos acutos faciens, porrectus, subsexangulato-ovalis, apice obtusus, subtruncatus, basi leviter contractus, omnino dense puberulus, bene 0.3 cm longus, 0.26 cm latus. Gynostemium latum, dorso convexum, absque anthera 0.4 cm longum, clinandrium excavatum, apice breviter late triangulari-dentiformi, auriculis bene majoribus rotundatis concavis membranaceis, pede cum gynostemio angulum obtusum, cum ovario angulum acutum faciens, lineari-oblongo truncato 0.3 cm longo. Anthera cucullata, ambitu semiorbicularis, connectivo convexo-incrassato, apice incurvo rotundato, 0.2 cm lata. Pollinia 8, valde inaequalia, 4 majora suboblonga, apice angustata, 4 minora suborbicularia. Stigma conspicuum, alte excavatum. Ovarium 6-sulcatum.

Philippine Islands: Island Leyte, Tacloban, 0 m, epiphyte in forest at sea level. (C. A. Wenzel n. 956, February 6, 1916: "sepals and petals white, lip white and yellow, 4 orange bracts").

The plant collected by Wenzel differs from Lindley's short diagnosis, so far as the latter goes, in the petals being not ovate but narrowed at the base, the manifestly blunt lobes of the lip, which, especially the mid-lobe, is hairy inside. Oakes Ames notes in his enumeration of Philippine

Orchidaceae (1924), p. 345, that the species is fairly common and widely distributed in the Philippines at sea level to 1000 m altitude. It is not impossible that more species or forms should be distinguished. At any rate a careful study in loco is very desirable.

Dr S. H. Koorders brought along from his expedition to North Celebes in 1895 living plants of an *Eria* which since then are in cultivation in the Botanic Gardens at Buitenzorg. I have always taken this to be *E. aporoides* Lndl. but since I have studied Philippine material I prefer to consider the Celebes plants a separate variety, of which the description follows underneath:

***Eria aporoides* Lndl. var. *celebica* J. J. S. nov. var. — *E. aporoides* Lndl.; Schltr. in Fedde Rep. XXI (1925), 165.**

Rhizoma elongatum, ramosum, repens, radicans, teres, c. 0.25—0.3 cm diam. Caules c. 2—3 cm dissiti, erecti, simplices, sectione transversa elliptici, omnino foliati et vaginis foliorum obtecti, c. 14 cm longi, cum foliis c. 3 cm lati. Folia alternatim bifaria, valde a latere compressa, equitantia, triangulara, subacuta, basi supra vaginato-fissa, carnosae, dilutius viridiae, margine superiore c. 2.3 cm, margine inferiore 2.5 cm longa, basi curvata 1 cm lata; vaginae tubulosae, a latere compressae, internodia superantes. Inflorescentiae axillares, vaginam dorso ad basin perforantes, brevissimae, 1-florae, rachide virescenti-alba, c. 1 cm longa. Bracteae c. 4, quaquaversae, patentissimae, lineari-lanceolatae ad ovato-oblongae, acutae, carnosulae, rigidae, dilute aureae, c. 1 cm longae, 0.2—0.475 cm latae. Flos mediocris, ephemerus, leviter suaveolens, c. 2 cm latus, sepalis petalisque subpatentissimis niveis. Sepalum dorsale anguste oblongum, obtusiusculum, leviter concavum, c. 1.3 cm longum, 0.45 cm latum. Sepala lateralalia ad pedem gynostemii decurrentia, mentum breve formantia, oblique anguste oblongo-triangulara, subfalcatula, acutiuscula, leviter obtusangule concava, c. 1.3 cm longa, basi 0.45 cm lata. Petala suboblique anguste oblonga, obtusiuscula, vix obtusangule concava, c. 1.15 cm longa, 0.4 cm lata. Labellum elastice insertum, gynostemio parallelum, 3-lobum, 3-costatum, costa intermedia a basi usque ad lobum intermedium decurrente angusta dense subfarinaceo-papillosa citrina, costis exterioribus approximatis humilibus latioribus glabris albis usque in basin lobi intermediarii productis, explanatum fere 0.9 cm longum, fere 0.5 cm latum; lobi laterales erecti, gynostemium superantes, nivei, parte libera porrecta triangulara acuta; lobus intermedius recurvus, oblongus, obtusus, vix retusus, convexus, dense subfarinaceo-papillosus, citrinus, c. 0.37 cm longus, 0.23 cm latus. Gynostemium subgracile, dorso convexum, subtus concavum, album, c. 0.5 cm longum, clinandrio excavato, apice brevi triangulo, auriculis bene longioribus rotundatis tenuibus valde concavis. Anthera cucullata, rotundata, flavescenti-alba. Pollinia 8, inaequalia, dilute flava, 4 majora compressa. Stigma alte excavatum, triangulo-orbiculare. Pes gynostemii cum ovario angulum acutum, cum gynostemio angulum obtusum faciens, rectus, obtusus, albus, apice macula aurantiaca ornatus, c. 0.275 cm longus. Ovarium 6-sulcatum, virescenti-album, c. 1.3 cm longum.

North Celebes: Menado. (S. H. Koorders, 1895, liv. pl. cult. in *Hort. Bog.* sub nrs. 14c and 78c, type). South Celebes. (Expedition L. van Vuuren, Mantri Noerkas n. 233, cult. in *Hort. Bog.*).

The variety differs from *Wenzel n. 956* especially in the acute side

lobes of the lip. The plant collected by the expedition L. van Vuuren differs according to my notes slightly in the lip being more hairy and the midlobe more ovate in outline and paler towards the top.

3. ***Eria decipiens*** Schltr. in Fedde Rep. X (1911), 85; XXI (1925), 165; Beih. LXXIV (1934), t. 41, Nr. 161.

North Celebes: Near Toli-Toli, on trees in mangrove swamps. (*R. Schlechter* n. 20692, January 1910).

According to Schlechter's description and figures this differs in the somewhat shorter and broader bracts (in the specimen in Herb. Lugd. Bat. they resemble more closely those of *E. aporoides* Lndl. and the var. *celebica*), the somewhat smaller flowers (sepals 1 cm long, whereas those of *E. aporoides* and the var. *celebica* measure 1.3 cm), the glabrous lip with an indistinct median band and very short, truncate side lobes not produced in front into a distinct free lobe.

Schlechter expresses l.c. the opinion that the species collected by Koorders in North Celebes might be *E. decipiens*. Supposing Schlechter's description and figure are correct this is certainly not the case.

The more or less powdery hairiness of the lip in *E. aporoides* and the var. *celebica* calls to mind the mealy covering on the callosities of the lip in the section *Mycaranthes* of *Eria*. As I have repeatedly stated this powdery covering is easily washed away by rain. Whether or not this is also the case in the section *Aporodes* is still to be examined. In the cultivated specimens of *E. aporoides* Lndl. var. *celebica* in Buitenzorg I did not notice this but nevertheless it may happen.

4. ***Eria soronensis*** Schltr. in Fedde Rep. IX (1911), 286. — *Dendrobium suaveolens* Krzl. (non Schltr.) in Pflanzenr. IV. 50. II. B. 21 (1910), 191.

New Guinea: Sorong. (*O. Beccari* n. 241).

According to Schlechter this species differs from *E. aporoides* Lndl. in the longer, more deeply 3-lobed, in front papillate labellum. In the material of *E. aporoides* Lndl. (*Dendrobium Brongniartii* Krzl.) sent by Prof. Ames the lobes of the lip are obtuse and especially the midlobe is puberulous. In his description of *D. suaveolens* Kränzlin says that the side lobes of the lip are acute, just as in *E. aporoides* Lndl. var. *celebica*, the hairiness, however, he does not mention. The sepals are said to measure 1 cm.

In the Rijksherbarium still another (?) species is represented, collected by Zippelius n. 25 in New Guinea. The leaves of this plant are somewhat narrower (and slightly recurved) than in the allied species; there are a few withered, much damaged flowers not good enough for study.

Eria (sect. *Trichotosia*) ***mollis*** Schltr. in Bull. Herb. Boissier, 2e ser. VI (1906), 460; in Fedde Rep. Beih. LXXIV (1934), t. 44, Nr. 175; J. J. S. Ic. Orch. Mal. I (1934), t. 57, II. — *Trichotosia mollis* Krzl. in Pflanzenr. IV. 50. II. B. 21 (1911), 147.

Caules approximati, dependentes, tenues, teretes, pallide virides, praesertim apicem internodiorum versus longe adpresse pilosi, c. 27 cm longi, 0.1 cm diam., internodiis c. 0.9—1 cm longis. Folia minusecula, erectopatentia, lanceolata, oblique subacuminata, acuta vel anguste obtusa, basi

angustata, convexa, utrinque subadpresse pallide fusce villosa, dilute viridia, c. 2.5—3.7 cm longa, 0.3—0.75 cm lata; vaginae tubulosae, apice erecto-patente oblongo canaliculato internodium superantes, patenter pallide fusce villosae, dilute virides, c. 0.3 cm diam. Inflorescentiae vaginam dorso ad basin perforantes, patentes vel subpatentissimae, laxae c. 5—8-florae, patentissime inaequaliter villosae, pedunculo brevi, tenui, rachide flexuosa, tenui. Bracteae rachidem semiamplectentes, late ovato-triangulo-subquingulares, acutiusculae, concavae, dorso et margine villosulae, 3-nerviae, c. 0.3 cm longae et latae. Flores parvi, c. 0.37 cm lati, 0.525 cm longi (absque pilis), sepalis dorso villosulis. Sepalum dorsale ovatum, obtusum, dorso ad apicem obtuse gibbosum, 3-nervium, c. 0.275 cm longum, 0.15 cm latum. Sepala lateralibus lacinia longa oblique oblonga concava ad pedem gynostemii decurrentia, mentum conspicuum cum ovario angulum acutum faciens oblongo-subcylindricum vix incurvum obtusum bene 0.2 cm longum supra basin c. 0.15 cm latum formantia, divergentia, oblique triangula, marginibus curvata, obtusa, subapiculata, dorso ad apicem obtuse gibboso-incrassata, concava, 3-nervia, c. 0.26 cm longa, basi 0.33 cm, margine antico 0.475 cm metientia. Petala divergentia, oblique lanceolata, vix falcata, obtusa vel subobtusa, glabra, 1-nervia, bene 0.25 cm longa, 0.075 cm lata. Labellum erectum, apice recurvum, concavum, spathulatum, 3-lobum, subtus convexum et $\frac{3}{5}$ partibus inferioribus adpresse pilosum, incrassationibus 2 obliquis convexis e sinibus inter lobos decurrentibus, incrassatione tertia convexa papillosa paulo decurrente ad apicem, 3-nervium, explanatum c. 0.44 cm, usque ad apicem loborum lateralium 0.35 cm longum, ad lobos laterales 0.2 cm latum, ungue lineari-oblongo, superne cuneato-dilatato; lobi laterales erecti, concavi, semiorbiculares, antice non producti, subcrenulati; lobus intermedius apice recurvus et canaliculatus, transverse quadrangulo-ovalis, subsexangulatus, apice truncatus et inconspicue subtrilobulus, minute crenulatus et inferne parce ciliatus, papillosus, fere 0.1 cm longus, 0.15 cm latus. Gynostemium breve, latum, cum ovario angulum obtusum faciens, dorso convexum, infra stigma convexum et longe barbatum, ceterum parvissime pilosum, cum anthera c. 0.1 cm longum, clinandrio transverso, excavato, apice late triangulo, apice contracto obtuso, auriculis obtusis. Anthera cucullata, margine tenui recurva, apice leviter 3-lobula, connectivo incrassato, c. 0.07 cm lata. Pollinia 8, lateraliter compressa, inaequalia, triangulo-pyriformia basi contracta. Stigma transverse quadrangulum, margine inferiore truncatum. Pes gynostemii cum ovario angulum acutum faciens, leviter incurvulus, linearis, intus glaber, c. 0.27 cm longus. Ovarium sessile, obconicum, longe subadpresse pilosum, fere 0.2 cm longum. Fructus sessilis, obovoideus, longe pilosus.

Sumatra: Indragiri, Soengei Lalah. (*R. Schlechter n. 13284*, May 1901). Padangse Bovenlanden, Agam, Batang Paloepeh. (*W. Groeneveldt*, cult. sub n. 77). Matoer, Poentjak Boekit. (*E. Jacobson*, cult. sub n. 827).

Geographical distribution: Endemic.

I have but little doubt that this plant is *E. mollis* Schltr. The puberulous callus at the base of the column foot of this author is evidently the bearded underside of the column.

Dr E. Jacobson describes the colour of the flowers as follows. Sepals transparently light green, petals greenish white bordered red, lip white, column dark purple, anther blackish purple.

Description from a living sterile plant and specimens preserved in alcohol.

Dendrobium (sect. *Desmotrichum*) **schistoglossum** Schltr.! in Engl. Bot. Jahrb. XLV (1911), Beibl. Nr. 104, 31; in Fedde Rep. Beih. LXXIV (1934), t. 35, Nr. 139; J. J. S. Ic. Orch. Mal. I (1934), t. 62, III.

Rhizoma repens, elongatum, valde ramosum, radicans, teres, dilute flavo-viride, c. 0.525–0.55 cm diam., initio vaginis tubulosis mox fatiscientibus tectum. Caules c. 5–8.5 cm distantes, adscendentes, ramosi, dilute viridiflavi, toti ad c. 16 cm longi; caulis primarius c. 5.5–13.5 cm longus, 3–6-nodus, sectione transversa ellipticus, c. 0.3 cm latus, initio vaginis tubulosis tectus, internodiis c. 1.25–2.2 cm longis, internodio ultimo in pseudobulbum valde compressum ovale ad oblongo-ovale apice truncatum basi brevissime contractum c. 3.7–4.5 cm longum 1.5–2.3 cm latum 1-folium incrassato. Folium erectum, lanceolatum, obtusum vel rotundatum et brevissime 2-lobum cum apiculo interposito, concavum, basi plus minusve conduplicatum, costa media supra sulcata subtus obtuse prominente, coriaceum, supra nitidule viride, subtus opacum, c. 14–16 cm longum, 3.3–3.7 cm latum. Inflorescentiae ante folium, fasciculatae, breves, squamis cinctae, pedunculis teretibus, nitidis, albis, 1-floris, basi vaginulatis, c. 0.7 cm longis. Bractea brevissima adpressa, pedicellum fere amplexans. Flores intervallis florentes, bene aperti, ephemeri, pallide flavescentes, c. 1.6 cm diam., sepalis dorso furfuraceis. Sepalum dorsale oblongo-triangulum, acutum, concavum, basi convexum, c. 0.95 cm longum, c. 0.4 cm latum. Sepala lateralia cum pede gynostemii mentum breve cum ovario angulum obtusum faciens dorso sigmoideo-curvedum dorso ad apicem bene convexum rotundatum c. 0.375 cm longum formantia, supra basin concavam recurva, divaricata, oblique triangula, acuta, margine antico basi oblique triangulo-dilatata, costa media dorso vix prominula, c. 1 cm, margine antico 1.3 cm longa, basi 0.7 cm lata. Petala oblique porrecta, oblique oblongo-elliptica, basi apiceque leviter contracta, apice acuta, concava, c. 0.95 cm longa, 0.34 cm lata. Labellum parallelum pedi gynostemii erectum, recurvum, 3-lobum, 3-costatum, costis exterioribus inter lobos laterales rectis parallelis dorso dilatatis et canaliculatis, in ungue lobi intermediarii tenuioribus curvato-disjunctis valde undulatis pallide viridi-marginatis ad basin lobi intermediarii abrupte terminantibus, costa mediana humiliter recta, costis omnibus in lamina lobi medii in costulam humilem verruculoso-rugulosam apicem attingentem productis, basi dilute viride, explanatum e basi leviter contracta cuneatum, c. 1.2 cm, usque ad apicem lorum lateralium 0.8 cm longum, ad lobos laterales 0.84 cm latum; lobi laterales erecti, incurvi, concavi, gynostemium longe superantes, oblique ovato-trianguli, obtusi, margine antico erosi; lobus intermedius ex ungue quadrangulo irregulariter crenato c. 0.2 cm longo 0.3 cm lato in laminam ambitu transverse suboblongam alte laceratam plicatam antice subtruncatam leviter excisam cum dente triangulo in sinu vix ochraceam c. 0.3 cm longam 0.9 cm latam dilatatus. Gynostemium cum ovario angulum obtusum faciens, album, c. 0.3 cm longum, clinandrio alte excavato, transverse ovali, apice (filamento) dentiformi triangulo, auriculis aequilongis, quadrangulis, truncatis, denticulatis. Anthera cucullata, transverse subquadrangula, apice medio triangulo-producta truncata et apice puberula cum lobulo multo brevior utrinque, alba, bene

0.15 cm lata. Pollinia 4, lateraliter compressa, oblonga, supra convexa, subtus concava, exteriora extus convexa, interiora angustiora, nitida, flava. Stigma alte excavatum, ovatum. Pes gynostemii cum ovario angulum obtusum faciens, apice dorso bene convexo dorso subsigmoideus, albus, apice intus bene excavatus nitide viridis et longitudinaliter crasse 3-costatus, c. 0.375 cm longus. Ovarium trigono-cylindricum, 6-sulcatum, nitidum, flavescens, apice obliquum, cum pedicello brevi c. 0.7 cm longum. Capsula oblique oblongo-ovalis, apice oblique breviter et crasse contracta, cylindrico-trigona, dorso subrecta, antice ventricosus-convexa, 6-sulcata, dilute viridis, c. 2.2 cm longa, 1 cm diam., rimis 6 in valvas 3 angustiores dilute flavas et 3 latiores pallide flavo-virides omnes basi apiceque connexas dehiscens.

Sumatra: Padangsche Bovenlanden, Padang Pandjang, 800 m. (*R. Schlechter* n. 159231, January 1907). Fort de Kock. (*E. Jacobson*, cult. sub nrs. 969 and 1146). Mentawai Islands. (*H. P. Verschuur*, cult. in Hort. *E. Jacobson*).

Geographical distribution: Endemic.

The species is not allied with *D. comatum* Lndl., as Schlechter suggests, but much nearer to *D. padangense* Schltr. and *D. xantholeucum* Rehb. f.

Description from a living plant send by Dr E. Jacobson from Fort de Kock, which flowered in my garden.

Dendrobium (sect. *Rhopalanthe*) **hypopogon** Krzl. in Pflanzenr. IV. 50. II. B. 21 (1910), 232.

Rhizoma abbreviatum, ramosum, radicans. Caules approximati, elongati, ad c. 40 cm longi, supra basin tenuem teretem c. 1—1.5 cm longam in pseudobulbum sicco fusiformem vel ovoideo-fusiformem valde rugosum plerumque ex internodio singulo compositum c. 1.7—2.4 cm longum 0.5—0.9 cm diam. incrassati, deinde tenues, teretes, foliati, internodiis c. 1.5—2.6 cm longis. Folia patentia, curvata, filiformi-subulata, tenuissima, c. 4—5.75 cm longa; vaginae tubulosae, apice truncatae. Inflorescentiae fasciculares, paucae, e nodis caulium partis ultimae c. 2—2.5 cm longae ex internodiis brevibus compositae, vaginulis siccis cinetae. Flores parvuli. Sepalum dorsale sublineare, apicem versus sensim angustatum, acutum, concavum, superne marginibus incurvis, 5-nervium, c. 1.4 cm longum, 0.28 cm latum. Sepala lateralia ad pedem gynostemii decurrentia, mentum satis breve cum ovario angulum obtusum fere rectum faciens conicum incurvum dorso convexum apice contractum obtusum c. 0.55 cm longum formantia, oblique triangula, falcata, apicem versus sensim angustata, apice marginibus incurvis subulato-acuminata, 5-nervia, c. 1.3 cm longa, basi rotundata 0.66 cm lata. Petala oblique linearia, falcata, apicem versus sensim angustata, acuta, concava, 3-nervia, c. 1 cm longa, 0.15—0.175 cm lata. Labellum ungue brevi pedi gynostemii brevissime adnatum, erectum, medio fere rotundato-acutangule recurvum, conduplicato-canaliculatum, 3-lobum, 5-nervium, callo 3-(vel 5-?) costato intus in flexu, inexplanatum e basi usque ad apicem loborum lateralium c. 0.56 cm metiens, explanatum c. 0.56 cm longum, 0.775 cm latum, ambitu transverse rhombeum; lobi laterales conspicui, erecti, margine antico marginem lobi intermedii continui, oblique trianguli, subfalcatulo-incurvi, margine postico rotundati, obtusi; lobus intermedius concavus, marginibus incurvis, dorso medio excepto grossius papillosus, explanatus latus, semiorbicularis, rotundato-truncatus, erosulus, c. 0.15 cm longus, 0.325 cm latus. Gynostemium

brevissimum, crassum, clinandrio excavato, filamento subulato, auriculis latis, bidentatis(?). Pes gynostemii cum ovario angulum obtusum faciens, incurvus, late linearis, $\frac{1}{3}$ parte superiore valde excavatus intus glandula longitudinali instructus et dorso rotundato-convexus, c. 0.55 cm longus. Ovarium oboenicum, c. 0.2 cm longum; pedicellus tenuior, fere 0.5 cm longus.

Sumatra: Westcoast, Goenoeng Singgalang, 130 m (?). (*O. Beccari s.n.*, 1878), 2600 m, epiphytcal in forest. (*H. A. B. Bunnemeijer n. 2366*, June 1918; "flowers greenish yellow").

Geographical distribution: Endemic.

The description of *D. hypopogon* Krzl. in many respects matches this plant, which, however, has shorter leaves, a rather large, erose, not emarginate midlobe of the lip provided with short papillae at the underside.

Description from a dried specimen with a single flower.

Dendrobium (sect. *Strongyle*) **hymenopetalum** Schltr.! in Engl. Bot. Jahrb. XLV (1911), Beibl. No. 102, 33; J. J. S. Ic. Orch. Mal. I (1934), t. 66, IV. — *D. subulatum* Lndl. var. *majus* J. J. S. in Bull. Dép. Agric. Ind. Néerl. No. XV (1908), 10.

Caules approximati, simplices, flexuosi, sectione transversa rhombeï, nitide virides, nodis initio flavi deinde nigrescentes, ad c. 22 cm longi, parte inferiore ima basi excepta foliata, c. 8.5–12 cm longa, parte superiore tenuiore, folia rudimentaria parva caduca gerente et flores gignente, internodiis e basi apicem versus dilatatis, c. 0.75–1.6 cm longis, apice ad c. 0.2 cm latis. Folia patentia, recta vel saepe leviter falcato-recurvula, acuta vel subacuta, basi obliqua, carnosa, rigida, opaco-viridia, c. 2.3–3.5 cm longa, 0.27–0.3 cm diam.; vaginae tubulosae, virides, internodiis aequilongae vel paulo breviores. Inflorescentiae e nodis caulium partis superioris, fasciculatae. Flores teneri, c. 1–1.3 cm longi, 0.75–0.9 cm lati, sepalis petalisque albidis, praesertim dorso plus minusve conspicue purpureo-striatis. Sepalum dorsale erectum, ovatum, obtusum, convexum, striis c. 3–5, c. 0.37 cm longum, 0.27 cm latum. Sepala lateralia cum pede gynostemii mentum conspicuum incurvum conicum obtusum c. 0.8–0.85 cm longum formantia, antice patentissima, oblique subovato-triangularia, obtusa, subapiculata, lacinia elongata oblique oblonga falcata ad pedem gynostemii decurrentia, basi concava, superne convexa, striis c. 5, c. 0.37 cm longa, basi c. 1.5 cm lata. Petala erecta, paululum inclinata, oblique subobovato-oblonga ad lanceolata, obtusa vel obtusiuscula, convexa, plerumque 1–3-striata, c. 0.33–0.375 cm longa, 0.16–0.125 cm lata. Labellum pedi gynostemii parallelum erectum, recurvum, concavum, cuneatum, apice dilatato obscure trilobulatum et undulatum, fascia longitudinali leviter incrassata lineari tricostulata inter lobos laterales macula flava notata apice obsoleta, nonnullis nervis radiantibus intus prominulis utrinque, album, nervis interdum purpurascentibus, explanatum c. 0.99–1.225 cm longum, 0.67–0.9 cm latum, lobis lateralibus rotundatis, recurvis convexusque, interdum incurvis, lobo intermedio brevi, lato, brevissime rotundato-2-lobulo, convexo, interdum concavo, c. 0.4 cm lato. Gynostemium cum ovario angulum obtusum faciens, brevissimum, latum, a dorso compressum, c. 0.15 cm longum, clinandrio excavato, auriculis brevissimis, obtusis. Anthera cucullata, a dorso compressa, aequilateraliter trapezi-

formis, apice lata truncata, glabra, c. 0.16 cm lata. Pollinia 4, lateraliter compressa, semiobovata, pallide flava. Stigma suborbiculare. Pes gynostemii cum ovario angulum fere rectum faciens, incurvus, linearis, tenuis, leviter 2-canaliculatus, nectario longitudinali oblongo leviter incrassato viride ad apicem, c. 0.8—0.85 cm longus. Ovarium 6-sulcatum, alternatim viridi- et purpureo-striatum, c. 0.2—0.25 cm longum; pedicellus tenuis, viridis, c. 0.35—0.45 cm longus. Fructus oblique obovoideus, obtusus, basi breviter acutus, rotundato-tri- vel subsexangulatus, 6-sulcatus, pallide viridis, c. 0.9 cm longus, 0.4 cm diam.

Sumatra: Padangsche Bovenlanden, Padang Pandjang. (*Fr. L. K. Storm van 's Gravesande*, liv. pl. cult. in *Hort. Bog.*). Fort de Kock. (*R. Schlechter* n. 159311, January 1907; *E. Jacobson*, liv. pl. cult. sub n. 984 pp.). Loeboek Sikaping. (*W. Groeneveldt*, liv. pl. cult. in *Hort. E. Jacobson* sub n. 156). Benkoelen, Boekit Kaba, Soeban Ajam, c. 1200 m. (Exp. *E. Jacobson* 1916, *Ajoeb*, liv. pl. cult. in *Hort. Bog.*).

Geographical distribution: Endemic.

This is much nearer to *D. subulatum* Lndl. than to *D. teloense* J. J. S., with which Schlechter compares it.

Description from living specimens.

var. *luisiifolium* J. J. S. nov. var.

Caulis c. 25 cm longi, inferne laxe 4—5-folii. Folia patentia, sicco falcato-recurva, teretia, acuta, c. 4.2—5.5 cm longa, 0.23—0.3 cm diam. Flores eis typi similes.

Sumatra: Benkoelen, Boekit Parisan, Rimbo Pengadang, 1000 m. (Exp. *E. Jacobson*, *Ajoeb* n. 206, June 1916, type).

Geographical distribution: Endemic.

This looks at first sight very different from the type, as the leaves are longer.

I have seen only a small portion of a plant partly dried, partly preserved in alcohol.

Bulbophyllum membranifolium Hook. f. Fl. Br. Ind. V (1890), 756; Ic. pl. XXI (1892), t. 2034; Ridl. Mat. Fl. Mal. Penins. I (1907), 65; Fl. Mal. Penins. IV (1924), 60. — *B. sanguineo-maculatum* Ridl. in Journ. Linn. Soc. XXXII (1896), 265; Mat. Fl. Mal. Penins. I (1907), 66. — *Phyllorchis membranifolia* O. K. Rev. gen. pl. II (1891), 677.

Rhizoma repens, flexuosum, teres, c. 0.4 cm diam. Pseudobulbi c. 0.7—1.5 cm inter se distantes, erecti, oblongo-ovoidei ad oblongi, obtuse subtrigoni, obtusi, opace virides, c. 3—4 cm longi, 1.6—1.2 cm diam., 1-folii. Folium petiolatum, lanceolatum, acute acuminatum, basi acutum, costa media supra canaliculata subtus carinata, subcoriaceum, flexibile, opacum, dilute viride, subtus pallidius, c. 11—14 cm longum, 4.1 cm latum; petiolus conduplicato-canaliculatus, c. 1.5—2.4 cm longus. Inflorescentiae e rhizomate, breves, uniflorae, pedunculo furfuraceo-punctato, c. 0.8 cm longo, vaginula basi arete tubulosa, superne ampliata, carinata, pallide viridi, furfuraceo-punctata. Bractea ampla, conduplicata, acuta, pallide viridis, furfuraceo-punctata, bene 1 cm longa. Flos majusculus, c. 3.9 cm latus et (inexplanatus) longus vel minor, ingratus, sepalis petalisque aurantiaco-ochraceis, violaceo-atropuree striatis vel punctatis, oleosis, utrinque nitidis, carnosulis. Sepalum dorsale ovarium fere continuum, ovatum, apicem versus angustatum, obtusum, supra basin utrinque angu-

latum, concavum, 11-striatum, dorso obtuse carinatum, c. 2.5 cm longum, 1.3 cm latum. Sepala lateralialia a sepalo dorsali remote inserta, ad pedem gynostemii decurrentia, porrecta, cum sepalo dorsali angulum subrectum facientia, margine antico excepto conglutinata, oblique oblonga, obtusa, subapiculata, basi valde obliqua, margine exteriore supra basin angulata, concavula, costa media dorso obtuse incrassata, 11-striata, c. 2.9 cm longa, fere 1.1 cm lata. Petala patentissima, ad pedem gynostemii decurrentia, oblique ovata, acuta, vix convexa, 9-striata, dorso ad basin tantum nitida, c. 1.95 cm longa, 0.975 cm lata. Labellum valde mobile, carnosum, valde curvatum, basi lobis 2 erectis reversisque postice rotundatis bene supra basin angulatis instructum, inter lobos subrectangule canaliculatum, ceterum convexum, supra longitudinaliter sulcatum, sulco costis 2 basi latis planisque c. $\frac{2}{3}$ loborum lateralium occupantibus apicem versus angustatis elevatis convexis infra apicem fere evanescentibus in $\frac{3}{5}$ partibus inferioribus echinulato-papillois limitato, apice arcte recurvum, obtusissimum, retuso-bilobulum, valde conico-verrucosum, subtus longitudinaliter sulcatum et supra basin crassiuscule papilloso-puberulum, magnam partem violaceo-atropurpureum vel inferne dilute flavum et dense atropurpureo-violaceo-punctatum, apice atropurpureo-violaceum, marginibus tantum ochraceum violaceo-maculatum, macula armeniaca subtus ad basin, c. 0.625 cm longum, 0.57 cm latum. Gynostemium breve, ceraceum, nitide flavescens, dorso excepto obscure purpurascenti-punctatum, c. 0.4 cm longum, clinandrio declivi, concavo, auriculis triangulis, stelidiis 2 in medio gynostemii, deorsum spectantibus, parallelis, subulatis, semipellucidis. ochrascentibus, leviter purpureo-punctatis, c. 0.25 cm longis. Anthera cucullata, antice triangula, apice truncata, atroviolacea, c. 0.2 cm lata. Stigma quadratum. Pes gynostemii cum ovario angulum rectum faciens, leviter obtusangule incurvus, apice libero incurvus, linearis, apicem versus angustatus, convexus, dorso 2-costulatus, magnam partem nitide purpureus, basi ochrascens purpureo-punctatus, apice ochraceus, c. 1 cm longus, apice libero 0.33 cm longo. Ovarium pedicellatum subclavatum, apicem versus sensim incrassatum, manifeste alato-6-costatum, basi flavescens, superne viride, furfuraceo-puncticulatum, ovarium c. 0.65 cm, pedicellus 2.5 cm longus.

Sumatra: Westcoast, L. Kota, G. Malintang, 1700 m. (*H. A. B. Bunnemeijer n. 4217*, August 1918). Djambi, G. Kerintji, 2200—2300 m. (*H. A. B. Bunnemeijer nrs. 9741, 9868 and 10174*, May 1920). Benkoelen, Boekit Barisan, Rimbo Pengadang, 1000 m. (Exp. *E. Jacobson* 1916, *Ajoeb n. 224*, June 1916; cult. in *Hort. Bog.* sub n. 799 and 873). Boekit Kaba, Soeban Ajam, 1200 m. (Exp. *E. Jacobson* 1916, *Ajoeb*, liv. pl. cult. in *Hort. Bog.* sub n. 4, *XII B, IX, 152*). Palembang, Tjoeroep, 800—1000 m. (*F. H. Endert*, cult. in *Hort. Bog.*).

Malay Peninsula: Selangor, Kwala Lumpur. (*Curtis*). Perak, G. Batu Putih. (*Wray*).

I have no doubt as to the identity of the species. The few differences between Hooker's description and figure and mine may be due to the fact that Hooker's description was drawn up from a dried specimen.

The flowers are punctate or striped red on a yellow ground.

Description from living specimens.

Bulbophyllum (sect. *Desmosanthes*) **croceum** Lndl. Gen. et sp. Orch. (1830), 57; Miq. Fl. Ind. Bat. III (1859), 649; J. J. S. in Fl. Buit. (1905),

433; Atl. fig. CCCXXVIII; in Fedde Rep. XXXII (1933), 308. — *B. Medusella* Ridl. in Journ. Fed. Mal. St. Mus. VIII (1917), 97. — *Diphyes crocea* Bl. Bijdr. (1825), 313. — *Phyllorchis crocea* O. K. Rev. gen. pl. II (1891), 677.

Rhizoma valde elongatum, repens, ramosum, praesertim prope pseudobulbos radicans, teres, sicco ad c. 0.2 cm diam., vaginis tubulosis, radicibus tenuibus. Pseudobulbi c. 5—8 cm dissiti, erecti, anguste oblongi ad lineares, verisimiliter compressi, truncati, sicco c. 2.3—3.5 cm longi, 0.3—0.77 cm lati, 1-folii. Folium erectum, petiolatum, oblongum, apice recurvulo-conduplicatum angustatumque, obtusum, basi breviter cuneata in petiolum contractum, margine recurvulo, costa media supra sulcata subtus carinata, multinervium, supra subtusque minute reticulato-venosum, sicco papyraceum, c. 4—7 cm longum, 1.45—2.5 cm latum; petiolus conduplicato-canaliculatus, c. 0.75—1.5 cm longus. Inflorescentiae 1—2 e basi pseudobulborum, raro etiam e nodis rhizomatis, erectae, pseudocapitatae, pluriflorae, pedunculo tereti, c. 4.5—9 cm longo, vaginulis c. 4—5 tubulosis ad c. 1.1 cm longis donato, rachide brevi, c. 0.45 cm longa. Bractee anguste lanceolatae, apicem versus angustatae, acutae, concavae, 5-nerviae, nervis exterioribus minutis, costa media dorso prominente, c. 1 cm longae, 0.26 cm latae. Flores ad c. 11, congesti, quaquaversi. Sepalum dorsale horizontale apice plus minusve recurvulum, e basi suboblunga concava longe filiformi-subulato-acuminatum, 3-nervium, c. 0.9 cm longum, bene 0.2 cm latum, parte attenuata c. 0.5 cm longa. Sepala lateralia intermedio multo longiora, basi verticalia, divergentia, e basi oblique oblongo-triangu la longissime filiformi-producta, 3-nerviâ, tota c. 2.6 cm longa, fere 0.2 cm lata, parte filiformi c. 2.1 cm longa. Petala multo minora, oblique oblonga, apice angustata, obtusiuscula, leviter concava, 1-nervia, c. 0.3 cm longa, 0.125 cm lata. Labellum parvum, mobile, simplex, curvulum, oblongo-ligulatum, apicem versus angustatum, obtusum, supra convexum cum canalicula longitudinali basi dilatata infra apicem evanescente costis obtusis limitata, parte mediana subtus longitudinaliter incrassata cum sulco longitudinali, marginibus tenuibus recurvis, glabrum, c. 0.23 cm longum, 0.12 cm latum. Gynostemium breve, crassum, dorso convexum, dorso et utroque latere costa longitudinali leviter convexa instructum, marginibus alato-dilatatis ad stigmatis marginem superiorem in dentem parvum obtusum productis, c. 0.16 cm longum, clinandrio excavato, transverse ovali, pariete postico lato breviter late bilobulo cum apiculo minimo interposito, auriculis porrectis, elongatis, antheram bene superantibus, subulatis, falcatis. Anthera cucullata, suborbiculari-quadrangula, basi retusa, apice brevissime obtusangule producta, connectivo convexo-incrassato, bene 0.05 cm lata. Stigma alte excavatum, rotundato-quadrangulum, apice leviter contractum. Pes gynostemii cum ovario angulum obtusum faciens, lineari-oblongus, $\frac{3}{5}$ partibus inferioribus sepalis lateralibus adnatus, parte superiore incurvus, truncatus, c. 0.13 cm longus. Ovarium breve, oboenicum, 6-sulcatum, c. 0.125 cm longum; pedicellus subaequicrassus, 0.075 cm longus.

Sumatra: Atjeh, Gajolanden, from bivouac 9, on the Lau Alas via the Agoesan ridge to Blang Kedjeren, 1800—2000 m, abundant in coppice on mountain ridge. (C. G. G. J. van Steenis n. 8764, February 1937). Very strong specimens.

West coast, Goenoeng Kerintji, Soengai Penoh, 900 m. (*H. C. Robinson and C. Boden Closs*). Laras Talang, Boekit Gombak. (*H. A. B. Bünnemeijer n. 5683*, November 1918, 1350 m; "flowers cream-colour, filiform parts orange, bracts green"; *n. 5708*, November 1918, 2330 m, "flowers yellow", only in bud). [In *n. 5708* the pseudobulbs are longer and thinner (4.75—5.75 cm long) and the leaves narrower (7.7—9.4 cm long, 1.25—1.6 cm broad).]

J a v a : G. Salak, Tjiapoes. (*C. L. Blume*). G. Boerangrang. (*C. L. Blume*). Bandoeng, Tjinjirean. (*A. Rant*, December 1911).

Blepharosepalum blepharosepalum Schltr. in Bull. Herb. Boiss. 2e sér. VI (1906), 462; in Fedde Rep. Beih. LXXIV (1934), t. 57, Nr. 225; J. J. S. Ic. Orch. Mal. II (1938), t. 101, I.

Rhizoma elongatum, repens, ramosum, teres, c. 0.25—0.3 cm diam. Pseudobulbi c. 7—10 cm dissiti, e basi valde depressa suborbiculari oblique conico-contracti, minute rugulosi, olivacei, c. 1.6 cm alti, 2.4 cm diam., 1-folii. Folium oblongum ad lanceolatum, acutum, basi petiolato-contractum, costa media supra sulcata subtus carinata, molliter coriaceum, supra nitide viride, subtus opacum, pallide viride, c. 16.5—18 cm longum, 4.4—3 cm latum, petiolo canaliculato, c. 2.1—2.3 cm longo. Inflorescentiae e basi pseudobulborum, solitariae, erectae, parte florifera nutante, laxae pluriflorae, pedunculo filum ferreum simulante, tereti, nitide fusco-violaceo, c. 17 cm longo, nonnullis vaginulis parvis tubulosis acutis donato, rachide angulata, colore pedunculi, c. 6 cm longa. Bractee minimae, triangulae, acutae, atrovioleae, c. 0.1 cm longae. Flores c. 13, parvi, leviter ingrati, c. 0.8 cm lati. Sepalum dorsale horizontale, subovato-oblongum, obtusum, concavum, apice vix recurvum, crispule albido-ciliatum, flavescenti-albidum, striis 5 cum 2 brevissimis longitudinalibus atrovioleae, c. 0.6 cm longum, 0.3 cm latum. Sepala lateralia divergentia, oblique ovato-triangularia, obtusiuscula, marginibus proximis crispule albido-ciliata, margine sepalum dorsale versus spectante subglabra, colore sepalum dorsalium, c. 0.7 cm longa, basi 0.4 cm lata. Petala parva, porrecta, subrectangule oblonga, rotundata, dimidio superiore ciliatum, hyalina, dimidio superiore atrovioleae-marginata et stria 1 notata, puncto atrovioleae ad basin, c. 0.37 cm longa, 0.17 cm lata. Labellum mobile, linguiforme, subellipticum, acutiusculum, basi incrassata truncatum, glabrum, costulis 2 longitudinalibus curvatis margini parallelis infra apicem in incrassationem paulo elevatam nitidam confluentibus, carnosum, opacum, hepaticum, macula triangulari albida subtus ad basin, c. 0.65 cm longum, 0.35 cm latum. Gynostemium cum ovario angulum obtusum faciens, breve, flavescent, c. 0.25 cm longum, 0.17 cm latum, auriculis triangularibus, acutis. Anthera cucullata, papillosa, connectivo alte incrassato, flavescent. Pollinia flava. Stigma altius excavatum, observe triangulum. Pes gynostemii cum ovario angulum obtusum faciens, obtusangule incurvus, tota longitudine cum sepalis lateralibus connatus, apicem versus dilatatus, sulco levi longitudinali instructus, albus, c. 0.3 cm longus, basi 0.1 cm, apice 0.15 cm latus. Ovarium anguste obconicum, 6 sulcatum, nitide purpureo-fusculum, c. 0.3 cm longum; pedicellus supra basin articulatus, colore ovarii, c. 0.25 cm longus.

S u m a t r a : Indragiri, Soengei Lalah. (*R. Schlechter n. 13241*, April 1901). Bangka. (*Schuurman*, liv. pl. cult. in *Hort. Bog.*).

I presume that this plant is *B. blepharosepalum* Schltr., though

Schlechter's description is not a full one and he says, that the petals are only a little shorter than the sepals.

The species is certainly very nearly allied to *B. limbatum* Lndl. if not identical.

It is a remarkable fact that the cultivated plant grows always straight downward on the small *Plumeria* tree on which it has been planted. In a rather short time the rhizome reaches the ground where the tip dies off.

Description from cultivated specimens.

Bulbophyllum (sect. *Aphanobulbon*) **odoratum** Lndl. Gen. et sp. Orch. (1830), 54; etc.

This is a widely distributed and polymorphous species in Malesia and a number of well defined forms is to be distinguished. To do so a careful study of numerous living plants is indispensable. For the present I propose the following varieties.

var. **obtusisepalum** J. J. S. nov. var.

Rhizoma validum, repens, ramosum, teres, c. 0.6 cm, sub pseudobulbis 0.95 cm diam., initio vaginatum, vagina ultima maxima pseudobulbum et petiolum amplexante c. 7—8 cm longa. Pseudobulbi parvi, c. 1.5—2 cm dissiti, disciformes, olivacei, c. 0.4 cm alti, 0.7—0.9 cm diam. Folium validum, erectum, petiolatum, lanceolatum, obtusum vel subobtusum, basi sensim in petiolum angustatum, margine recurvum, costa media supra canaliculata subtus obtuse prominente, firmiter crasse coriaceum, utrinque nitide viride, c. 25—30 cm longum, 5.5—6.25 cm latum; petiolus usque ad basin canaliculatus, c. 7—9 cm longus. Inflorescentiae e basi pseudobulborum, erectae, subdense multiflorae, pedunculo subtereti, pallide virescenti, atrofusce furfuraceo-punctato, c. 15.5—19 cm longo, bene 0.4 cm diam., pluribus vaginulis tubulosis superne lateraliter compressis et paulo inflatis apiculatis pallidis atrofusce furfuraceo-punctatis superioribus maximis ad c. 3—5 cm longis donato, rachide elongata, multicostata, papillosa, colore peduncululi, 28 cm superante, cum floribus c. 1.4—1.65 cm diam. Bractee ovario subadpressae, lanceolatae, acutae, concavae, albidae, medio vix virescentes, dorso furfuraceae, ad c. 0.525 cm longae. Flores parvi, patentissimi, carnosi, minute papilloso, albidus, in alabastro pallide virides, odore insuavi, c. 0.55—0.625 cm lati, sepalis dorso fusce furfuraceo-punctatis. Sepalum dorsale ellipticum, subacutum, dorso apicem versus valde gibboso-incrassatum, basi latiusculum, c. 0.3—0.36 cm longum, 0.2 cm latum. Sepala lateralia oblique subovali-triangularia, obtusa, dorso praesertim versus apicem valde obtuse incrassata, dorso convexa, intus subplana, c. 0.34—0.36 cm longa, 0.2—0.22 cm lata. Petala minuta, subacuta vel apiculata, c. 0.1 cm longa, 0.075 cm lata. Labellum parvum, mobile, obtusangule recurvum, obsolete trilobum, lobis lateralibus erectis latis plus minusve rotundatis, lobo intermedio recurvulo, paulo angustato, subtus convexo, parte mediana inter lobos laterales bene incrassata sed non elevata, costa longitudinali valida lateraliter compressa papillosa apice libera lobum aequante in lobo intermedio, flavescenti-album, inexplanatum c. 0.1 cm longum. Gynostemium breve, album, c. 0.1—0.125 cm longum, apice obtusissimo, auriculis antheram superantibus, subulatis, rectis vel falcato-decurvis, margine superiore dente parvo donatis, margine inferiore basi obtusangule vel rotundato-dilatatis. Anthera cucullata, lateraliter

compressa, in rostrum triangulum obtusum recurvum producta, connectivo costato-incrassata, alba, c. 0.05 cm longa. Pollinia lateraliter compressa, oblique triangulo-orbicularia, flava. Stigma alte excavatum, rotundato-quadrangulum vel rotundato-subtriangulum. Pes gynostemii cum ovario angulum obtusum faciens, rectus, lineari-oblongus, apice truncatus, infra stigma leviter convexo-incrassatus, pallide flavesceus, c. 0.08 cm longus. Ovarium 6-sulcatum, cum pedicello rectum, teres, albidum, fusce furfuraceo-punctatum, c. 0.26—0.4 cm longum.

Sumatra: Benkoelen, Boekit Barisan, Rimbo Pengadang, 1000 m. (Exp. E. Jacobson 1916, *Ajoeb*, liv. pl. cult. in *Hort. Bog.* sub n. 692, type).

This variety differs from *B. odoratum* Lndl. in the more robust inflorescences, the colour and the odour (which recalls a pigsty to mind) of the flowers and especially the broad blunt lateral sepals.

In the Botanic Gardens at Buitenzorg there are in cultivation some other specimens (e.g. *E. Jacobson* cult. sub n. 167, n. 231, n. 1772, all from Sumatra, and also some from Borneo), which more or less resemble this but differ in some respects. I did not include them for keeping the variety pure. Among these similar looking plants there are some the flowers of which exhale only a weak odour, whereas others have the usual sweet scent.

The description of *B. elatius* Ridl. is somewhat suggestive of the plant described here. Ridley's species has, however, much larger and globose pseudobulbs, and a lanceolate brown lip.

Description from a living plant.

var. **polyarachne** (Ridl.) J. J. S. nov. var. — *B. polyarachne* Ridl. in Journ. of the Fed. Mal. St. Mus. VIII, Bot. (1917), 77.

Rhizoma repens, ramosum, teres, radicans, sicco ad 0.6 cm diam., vaginis amplis tubulosis sicco nigrescentibus summis ad 3—4.5 cm longis. Pseudobulbi 1—3.5 cm dissiti, parvi, disciformes, sicco ad 0.45 cm diam. Folium petiolatum, oblongum vel subobovato-oblongum, obtusum ad rotundatum cum apiculo parvo obtuso, basi sensim in petiolum angustatum, costa media supra canaliculata, dorso obtuse prominente, coriaceum, 12.5—21.5 cm longum, 3.2—5.2 cm latum; petiolus canaliculatus, 5—9 cm longus. Inflorescentiae 1—2 e basi pseudobulborum, erectae, subaxe multiflorae; pedunculus 13—17 cm longus, vaginulis 6—7 tubulosis basi adpressis superne paululum ampliatis breviter acuminatis ad 3—3.5 cm longis, superioribus saepe bracteiformibus; rachis costata, furfuracea, 16—34 cm longa. Bractee lineari-subulatae, acutae, dorso furfuraceae, concavae, c. 0.6 cm longae, 0.125 cm latae. Flores numerosi, 0.85—0.9 cm diam., sepalis carnosulis, praesertim dorso ad basin furfuraceo-punctatis. Sepalum dorsale horizontale, ovarium circiter continuum, incurvum, e basi concava subovali-oblonga longe subulato-contracto-acuminatum, subacutum vel subobtusum, 3-nervi, 0.6 cm longum, parte contracta 0.3 cm longa, 0.2 cm latum. Sepala lateraliter divergentia, angulum subrectum facientia, e basi oblique triangula longe subulato-acuminata, 3-nervia, costa media dorso leviter convexo-incrassata, 0.7 cm longa, parte angustata 0.4 cm longa, 0.225 cm lata. Petala minima, patentia, ovata vel plus minusve triangula, obtusa vel subacuta, 1-nervia, 0.14 cm longa, 0.075 cm lata. Labellum mobile, membrana parva tenui affixum, minutum, simplex,

supra basin et infra apicem obtusangule recurvum, marginibus incurvis late canaliculatum, plus minusve costulato-trinervium, apice grosse glanduloso-papillosum, expansum ovatum, apice triangulo-acutatum, 0.17 cm longum, 0.125 cm latum. Gynostemium brevissimum, crassum, 0.125 cm longum, clinandrio excavato, suborbiculari, pariete postico paulo producto obtusangule exciso cum filamento minimo tenui, auriculis porrectis anthera paulo longioribus breviter subulato-acuminatis margine postico dente incurvo donatis, pede cum ovario angulum obtusum faciente vix incurvulo e basi dilatata quadrangulo-contracto truncato 0.125 cm longo. Anthera cucullata, lateraliter compressa, a latere visa suborbicularis, rostro brevi triangulo, connectivo costiformi, bene 0.05 cm longa. Stigma alte excavatum, suborbiculare, margine inferiore convexo-incrassatum. Ovarium obconicum, 6-sulcatum, furfuraceum, fere 0.2 cm longum, pedicello tenuiore 0.2 cm longo.

Sumatra: West coast, Soengai Koembang, 1500 m. (*H. C. Robinson* and *C. Boden Kloss*, "flowers white"). G. Kerintji, 1500—1600 m, forest on tree. (*H. A. B. Bünnemeijer* nrs. 8959, type, 8981 and 9023, March 1920, "flowers white to greenish"). Lake of Manindjau. (*W. M. Docters van Leeuwen*, 1920, cult. in *Hort. Bog.* sub n. 641).

I think it better to consider this plant a variety of *B. odoratum* Lndl.

The sepals of the plant collected by Prof. Docters van Leeuwen near the Lake of Manindjau are somewhat shorter than in those of Kerintji Peak.

Description from herbarium and flowers preserved in alcohol (*Bünnemeijer* n. 8959).

***Porphyroglottis Maxwelliae* Ridl.** in Journ. Linn. Soc. XXXI (1894), 290, t. 15.

Habitus *Grammatophylli speciosi* Bl. Caules approximati, obtuse angulato-cylindrici, nitide cinereo-virides, multifolii, c. 1—1.1 m longi, 3 cm diam., superne attenuati, internodiis c. 2.3—2.5 cm longis, superioribus paulo brevioribus, radicibus *Grammatophylli speciosi* Bl. Folia patentia, linearia, apicem versus sensim angustata, acuta, costa media supra sulcata subtus obtuse prominente, nervis 3 majoribus et nonnullis tenuibus utrinque, omnibus semipellucidis pallide flavescentibus, coriacea, supra nitidula, subtus opaca, sordide atroviridia, c. 40—47 cm longa, ad c. 2.3 cm lata, superiora angustiora; vaginae verisimiliter initio tubulosae, antice tota longitudine mox rumpentes et sicco membranaceo-marginatae, apice utrinque dente instructae, internodia plus quam duplo superantes, sordide flavo-virides. Inflorescentiae e basi caulium, adscendentes, arcuati, elongati, caules multo superantes, superne pauciramosae, laxae multiflorae, pedunculo subtereti, subolivaceo, lenticellis pallide viridibus punctato, pruinoso, ad c. 1.5 cm longo, inferne 0.9 cm diam., vaginulis c. 7 brevibus adpressis basi tubulosis obtusissimis dilute sordide flavo-viridibus fusciscenti-suffusis ad c. 1.8 cm longis superne laxioribus donato, rachide flexuosa, angulato-tereti, sordide fusco-violacea, pallide viridi-punctata, pruinosa, ad c. 1.4 m longa, internodiis ad c. 8 cm longis, superioribus brevioribus, ramis c. 1—2, patentibus, ad c. 1 m longis, pedunculo partiali compresso. Bractee adpressae, subovales, cucullato-concavae, rotundatae, basi lata rachidem partim amplectentes, sordide fusciscentes, superne obscuriores, basi nectarifluae, ad c. 0.9 cm longae. Flores in alabastro patentes, sursum curvi, deinde patentissimi, horizontales, reversi, labello supero, simul pauci

expansi, mediocres, c. 4 cm longi, sepalis petalisque arcuato reflexis, opacis, avellaneis, intus praesertim margine leviter pallide purpurascensuffusis, sepalis dorso purpureo-suffusis, petalis intus inconspicue et minutissime purpureo-punctatis. Sepalum dorsale subelliptico-oblongum, obtusum, convexum, marginibus recurvum, medio concavum, apice papilloso-ciliatum, c. 2.6 cm longum, 1.6 cm latum. Sepala lateralia haud ad pedem gynostemii decurrentia, oblique oblonga, obtusa, convexa, parte mediana concava, marginibus recurva, c. 2.5 cm longa, 1.7 cm lata. Petala oblique oblonga, obtusa, basi breviter contracta, convexa, c. 2.5 cm longa, 0.9 cm lata. Labellum unguiculatum, ungue angusto linear-oblongo, basi paulo dilatato et satis rigido, quam pedem gynostemii tenuiore, apice dilatato tenuiore concavo et flexili, plano leviter, 5-costulato, nitidulo, albido, magnam partem purpuree maculato-suffuso, c. 0.5 cm longo, lamina valde mobili, simplici, cum ungue excavationem formante, supra basin abrupte recurva, subselliformi, in $\frac{3}{5}$ partibus supra basin obtusangule recurva, subtus valde concava, supra visum subsexangulato-obovato, $\frac{1}{3}$ inferiore valde convexa longitudinaliter 5-costata albida dense longitudinaliter atropurpuree maculato-striata et longe atropurpuree velutino-pilosa, in $\frac{1}{3}$ supra basin excavatione transversa breviter pilosa instructa, $\frac{2}{3}$ partibus superioribus marginibus leviter incurvis concavis inferne atropurpureis superne flavis dense atropurpureo-pilosis exceptis convexa, infra flexum macula quadrata glabra nitidula atropurpurea donata, $\frac{1}{3}$ parte apicali citrina parce pilosa, explanata ovali, subpandurata, apice late rotundata, c. 1.65 cm longa, 1 cm lata. Gynostemium conspicuum, cum ovario angulum obtusum faciens, supra medium valde incurvum, dorso convexum, subtus leviter concavum, vix virescenti-albidum, apice purpurascens, omnino purpuree marmorato-punctatum et striolatum, c. 1.6 cm longum, steliis 2 patentissimis porrectis divergentibus lateraliter compressis oblique oblongis obtusis c. 0.5 cm longis in $\frac{2}{5}$ partibus supra basin, clinandrio parvo cum carina longitudinali, apice producto triangulo obtuso atropurpureo. Anthera cucullata, late ovato-cordata, apice recurva rotundata et nitida, gibbo triangulo ad basin, pallide flavescens, minute purpureo-punctata, purpureo-marginata, basi flavescens, c. 0.27 cm lata. Pollinia 2, superne divergentia, lateraliter oblique compressa, a latere visa bene semiotunda (semiovalia), dorso longitudinaliter alte et anguste excavata, flava, caudiculis 2 tenuibus concavis flavis marginibus proximis conglutinatis pollinia paulo superantibus glandula magna orbiculari-quinquangulata convexa nitida alba vix purpurascensuffusa in utraque parte canaliculae longitudinalis inserta, tota c. 0.25 cm longa. Rostellum 3-partitum, laciniis subulatis, intermedia longissima cum carina clinandrii decurrente, lateralibus subfalcatis. Stigma magnum, transverse rhombeum, suboctangulatum, marginibus dilatatis gynostemio latius, margine inferiore incoctangulatum recurvumque. Pes gynostemii brevis, ovarium continuus, cum gynostemio angulum rectum faciens, subquadrangulus, rotundatus, subtus convexus, colore gynostemii, c. 0.6 cm longus. Ovarium 6-sulcatum, c. 1.8 cm longum, cum pedicello 2.5 cm longo nitide atropurpureum. Fructus magnus, pendulus, reliquiis floris coronatus, obovoideo-ellipsoideus, obtuse trigonus, lateribus medio leviter depressus, lateribus et angulis costa latiuscula convexa instructus, parte superiore alternatim trigonus cum

costa laterum inferiorum in canalicula marginibus costato-elevatis applicatisque abscoudita, apice obtusus, basi in pedicellum contractus, pallide virescens, dense sordide subfusco-violaceo-suffusus, c. 8.25 cm longus, 3.9 cm diam., superne rimis 3 dehiscens, valvis apice connatis, pedicello curvato, sordido, c. 3 cm longo.

Borneo: Sarawak (*Mrs. Maxwell*). Pontianak ? (*Native collector*, cult. in *Hort. Bog.*).

Geographical distribution: Endemic.

Mr. D. van Mullem, Batavia, bought the plant, from which the above description was taken, from a native, who brought it from Pontianak, and kindly presented the Buitenzorg Botanic Gardens with it.

Mr. Ridley's description is really good, but I thought it desirable to give a more detailed one. The figure cited gives a clear idea of the species.

The plant flowers freely at Buitenzorg, each stem emitting as much as three scapes from its base. These surpass the leafy stems and attain a length of more than 3 meters. The colour of the flowers is best compared with young hazelnut suffused with purple, the lip being blackish purple for the greater part with a lemon-coloured blotch at the apex. The lip has a narrow claw, broader and flexile upwards, so that the body of the lip is movable. It is, however, not at all inserted elastically like in *Plocoglottis*, as suggested by Dr R. Schlechter. The flowers last a few days.

Though very interesting from a botanical point of view the species is of no value in respect to beauty.

Adenoncos celebicus Schltr. in Fedde Rep. X (1911), 192; Beih. LXXIV (1934), Nr. 289; J. J. S. Ic. Orch. Mal. II (1938), t. 122, III.

Caulis dependens, radicans, basi bene ramosus, apicibus adscendens, sectione transversa ovalis, dilute viridis, ad c. 20 cm longus, 0.23—0.25 cm latus, internodiis c. 0.6—0.65 cm longis. Folia basi plus minusve torta, patentia, recurva, lanceolata, apice valde inaequalia, plus minusve biloba, latere longiore obtusa, latere breviorae saepe dentiformia et acuta vel obtusa, supra longitudinaliter sulcata et utroque latere convexa, transverse rugosa, subtus obtusangula convexa, crasse carnosae, rigidae, nitidae, atroviridia, c. 0.27—3.8 cm longa, 0.85—1 cm lata; vaginae tubulosae, internodia multo superantes, rugulosae, nitide virides, 0.35—0.37 cm latae. Inflorescentiae 2 vaginas perforantes, brevissimae, patentae, 1-florae, pedunculo nonnullis vaginulis brevissimis tubulosis carinatis viridibus donato, c. 0.15 cm longo. Flos in genere magnus, sepalis petalisque incurvis subcupuliformis, dilute viridis, c. 1.1 cm latus. Sepalum dorsale oblongum, breviter acutatum, apice dorso subcarinatum et lateraliter compresso-apiculatum, minute erosulum, concavum, carnosum, nitidum, bene 0.6 cm longum, 0.375 cm latum. Sepala lateralia oblique oblonga, obtusiuscula, dorso conico-apiculatum, minutissime erosula, concavula, dorso convexa, carnosae, c. 0.75 cm longa, fere 0.4 cm lata. Petala oblique oblonga, apice recurvula, obtusa, recta vel subfalcata, erosa, praesertim inferne incrassata et intus convexa, dorso convexa, dilute viridia, margine pallidiora, c. 0.525 cm longa, 0.225 cm lata. Labellum pedi gynostemii adnatum, crasse carnosum, 3-lobum, subtus convexum, c. 0.75 cm longum, hypochyllo concavo, pulvino longitudinali oblongo obtuso farinaceo niveo

et inferius e pariete postico seta longitudinali horizontali pulvino adpressa et multo brevior alba instructo, inexplanato c. 0.46 cm lato, post 4 dies castaneo-rubro et flavescenti-marginato, lobis lateralibus erectis triangulis obtusis, lobo intermedio hypochyllo bene majore crassissimo, late triangulo, obtusangule acutato, supra convexo, basi semilunato-excavato et utrinque in lobulum triangulum producto, nitido, deinde viridi-fusco, c. 0.46 cm longo, 0.575 cm lato. Gynostemium brevissimum, latum, usque ad apicem rostellii c. 0.17 cm longum, apice truncatum, clinandrio concavulo antice gibboso, auriculis obtusis. Anthera cucullata, transverse ovalis, in rostrum breve leviter retusum producta, flavescent, fere 0.2 cm lata. Pollinia 4, inter se libera, ovali-obovoidae, flava, stipite mediocri lineari antice convexo albo, glandula oblonga, tota fere 0.2 cm longa. Rostellum breve, 2-dentatum. Stigma quadrangulum, basi dilatatum, margine inferiore flexuosum. Ovarium abbreviatum, pallide viride.

Celebes: Toli-toli. (*R. Schlechter* n. 206931; January 1910).

Soela Islands: Tandjoeng Wanabahi. (Exp. *P. van Hulstijn*, *Mantri Atje*, cult. in *Hort. Bog.* n. 79).

The keel of the callus of the lip described by Schlechter is a free bristle-like appendage.

Description from a specimen from the Soela Islands cultivated in the Buitenzorg Gardens.

Phalaenopsis pulcherrima J. J. S. in Fedde Rep. XXXII (1933), 366. — *Ph. Esmeralda* Rehb.f. in Gard. Chr. (1874), II, 582; in Otia bot. hamb. I (1878), 35; Revue Hort. (1877), 106—107, f. 17—19; Floral Mag. (1879), t. 358; Orchidoph. (1881), 9 cum ic.; Warner and Williams Orch. Alb. VII, t. 321; Rolfe in Gard. Chr. (1886), II, 276; Bot. Mag. CXVI (1890), t. 7196; Hook.f. Fl. Br. Ind. VI (1894), 31; Veitch Man. Orch. p. VII, 27; Ridl. Mat. Fl. Mal. Pen. I (1907), 152. — *Ph. antennifera* Rehb.f. in Gard. Chr. (1879), I, 398; (1882), II, 520; Rolfe l.c. (1886), II, 176. — *Ph. Regnieriana* Rehb.f. l.c. (1887), II, 740. — *Ph. Buyssonianae* Rehb.f. l.c. (1888), II, 295. — *Doritis pulcherrima* Lindl. Gen. et Sp. Orch. (1883), 178; Rolfe in Orch. Rev. XXV (1917), 195; Ridley Fl. Mal. Pen. IV (1924), 158.

Caulis abbreviatus ramosus, radicibus densis crassis teretibus cinereis. Folia pauca, patentissima ad patentia, oblique obtusa vel subacuta, plerumque brevissime bidentata cum mucrone brevi interposito, basin versus angustata, costa media supra sulcata subtus obtuse prominente, carnosa, utrinque nitida, supra cinereo-viridia, cinereo-punctata, margine et tota facie inferiore violaceo-suffusa, subtus dense pallide viridi-punctata, c. 6.25—8.5 cm longa, 2.5—2.75 cm lata; vaginae breves, a latere compressae, basi tubulosae, carnosae, violaceo-virides. Inflorescentiae erectae vel adscendentes, elongatae, simplices vel parum ramosae. laxae multiflorae, diu flores gigntes, pedunculo sordide pallide viridi et violaceo-suffuso c. 12.5—20 cm longo, vaginulis 3—4 brevibus tubulosis donato, rachide 33 cm superante, colore pedunculi. Bractee quaquaversae, pedicello adpressae, persistentes, triangulae, concavae, colore rachidis, ad c. 0.4 cm longae. Flores quaquaversi, c. 2.4 cm lati, 2.7 cm longi. Sepalum dorsale basi recurvulum convexumque, ceterum concavum, ellipticum, obtusum, minute incurvo-apiculatum, purpurascens-roseum, apice intus inconspicue purpureo-puncticulatum, c. 1.325 cm longum,

0.74 cm basi 0.36 cm latum. Sepala lateralialia ad pedem gynostemii decurrentia, reflexa, oblique triangula, margine postico valde rotundato fere oblique quadrangula, margine antico subrecta, apice obtusa, basi antice in laciniam brevem angustam dilatata, dilute purpurascienti-rosea, marginibus proximis albida, apice vix ochrascenti-suffusa et parcellissime purpureo-punctata, usque ad apicem ovarii c. 1.15 cm longa, margine antico 1.35 cm metientia, basi 1.1 cm lata. Petala suboblique subspathulata, e basi cuneata obovato-rhombea, obtusissima, dilute purpurascienti-rosea, c. 1.34 cm longa, 0.8 cm basi 0.3 cm lata. Labellum apici pedis gynostemii insertum, erectum, cum eo angulum acutum faciens, vix supra medium abrupte recurvum, unguiculatum, 3- vel potius 5-lobum, lamella conspicua carnosula horizontali utroque latere adnata cuneato-triangula convexa antice plus minusve quadrilobulata alba purpureo-puncticulata ad basin lobi intermedii inter lobos laterales, inexplanatum c. 1.4 cm, arte explanatum cruciatum c. 1.65 cm longum, ad lobos laterales 0.85 cm latum, ungue lineari concavo subtus convexo albo dilute purpureo-puncticulato, c. 0.4 cm longo, 0.2 cm lato; lobi laterales erecti, paralleli, cum ungue angulum obtusum facientes, apice basin gynostemii versus spectantes, subulato-trianguli obtusi, carnosuli, canaliculati, subtus convexi, colore unguis, c. 0.33 cm longi; lobus intermedius conspicuus, erectus, supra basin abrupte recurvus, breviter unguiculatus, trilobulus, explanatus c. 1.125 cm longus, ad lobulos laterales 1.65 cm latus, ungue obverse aequilateraliter trapeziformi, fere 0.2 cm longo, apice 0.6 cm, basi 0.34 cm lato, lamina costis 5 parallelis convexis in lobulo intermedio ramosis et flabellato-recurvis albis ornata, lobulo intermedio et disco costis exceptis pulchre purpureo, lobulis lateralibus remotis adscendentibus erectis arte explanatis divaricatis oblique oblongis rotundatis basi convexis apice leviter concavis intus prominenter nervosis pallide ochrascentibus longitudinaliter apice et margine postico confluentem cinnamomee venosis superne purpureo-suffusis c. 0.5 cm longis 0.37 cm latis, lobulo intermedio deflexo lato subquingulari-semielliptico obtuso brevissime apiculato-acuminato convexo verrucoso carnosus subtus concavo c. 0.64 cm longo 0.775 cm lato. Gynostemium crassiusculum, supra basin parum constrictum, dorso convexum, basi antice utrinque in lobulum brevem obtusum carnosum productum, apice producto late triangulo obtuso convexo subtus concavo, purpureum, margine pallidius, basi antice purpureo-puncticulatum, c. 0.77 cm longum. Anthera cucullata, transverse ovalis, in rostrum conspicuum triangulum acutum acuminata, membranacea, flavescenti-alba, rostro vix purpurascenti-suffusa, c. 0.27 cm lata. Pollinia 4, a dorso compressa, saturate aurea, 2 antica suborbicularia, 2 postica vix minora magis triangula, cum stipite elongato spathulato apice rotundato recurvoque albo et glandula conspicua ovali hyalina c. 0.525 cm longa. Rostellum longissimum, deorsum spectans, undatum, lineare, apice in lacinias 2 oblongas obtusas partitum, subtus ad basin carinatum. Stigma maximum, alte excavatum, obverse triangulum. Pes gynostemii cum ovario angulum subrectum cum gynostemio angulum obtusum faciens, rectus, linearis, basi gynostemii multo angustior, antice medio paululum incrassatus, albus, dimidio inferiore purpureo-punctatus, c. 0.95 cm longus. Ovarium tenue, 6-sulcatum, dilute purpureum, c. 0.6 cm longum; pedicellus aequicrassus, virescens, c. 0.9 cm longus.

Sumatra: Gajoelanden, Takengon, near Isak, c. 800 m, in forests of *Pinus Merkusii* Jungh. et de Vr., terrestrial on rocky and somewhat sandy ground. (L. Snell, cult. in Hort. E. Jacobson and in Hort. J. J. Smith sub n. 1968). Near Djamat, 500—600 m. (L. Snell). Paparek. (R. Pringgo Atmodjo n. 196, March 1904).

Malay Peninsula: Kedah Peak, 650 m. (Mohamad Haniff). Setul Heath. (Dr. Ellis). Patani. (Annandale). Tringganu. (Yapp).

Langkawi Islands. (C. Curtis).

Cochin China.

Cambodia.

Burma.

The genus *Doritis* Lndl. of which Lindley knew one species only has, on account of the very insufficient description and the want of good herbarium material, been uncertain for a long time. But also after Rolfe (in Orchid Review XXV (1917), 195) had made clear that Lindley's plant is nothing but the well-known *Phalaenopsis Esmeralda* Rehb.f., some authors have persisted in classing with it such species as do strictly spoken not belong to it, notwithstanding the fact that Rolfe when establishing the limits of *Doritis*, proposed a new genus, *Kingiella* Rolfe, for those other species. This confusion has, in my opinion, to be ascribed to the fact that the characteristics are, indeed, not so sharp as might be desired. I am convinced that it is very difficult to keep these two genera apart from *Phalaenopsis* without being compelled to a continued division of this genus on the base of what are, in my opinion, only subordinate characters.

As the principal difference of *Doritis* with *Phalaenopsis* is cited the long lip-claw provided with a couple of appendages. It is true that the claw of the lip is long, but since also in other species a claw is present (*Ph. amabilis* Bl., *Ph. Denevei* J. J. S. etc.) the difference is only gradual. As to the pair of appendages, these are, in my opinion, the real sidelobes, whereas the midlobe is trilobate. One should admit that from this point of view the sidelobes are, indeed, very similar to those of *Ph. sumatrana* Korth. et Rehb.f. and allied species.

As to *Kingiella* I think that its separation is still less founded. Rolfe's description "characterized by the union of the lateral sepals with the base of the lip, forming a spurlike mentum, from which the lobes are borne directly, etc.", lacks in my opinion exactitude. Ridley's definition "base of lip adnate to foot of column and forming a mentum" is surely better, although properly saying the whole affair settles down to a slight saccate projection at the base of the lip between the lateral lobes, which, however, is also more or less the case with *Ph. javanica* J. J. S., *Ph. fimbriata* J. J. S., *Ph. Denevei* J. J. S., etc. And the sidelobes tally, as to their structure, well with those of *Ph. sumatrana* Korth. et Rehb.f. and related species, only they are wider in proportion.

The presence of *Ph. pulcherrima* in Sumatra is another proof of the affinity between the floras of Sumatra and Farther India.

Description from cultivated Sumatran specimens.

Vanda sumatrana Schltr.! in Engl. Bot. Jahrb. XLV (1911), Beibl. No. 104, 57; in Fedde Rep. Beih. LXXIV (1934), t. 74, Nr. 296; J. J. S. Ic. Orch. Mal. II (1938), t. 124, I.

Planta valida. Caulis teres, c. 75 cm altus, c. 1.5 cm diam., dense foliatus, radicibus teretibus, c. 1.1 cm diam. Folia erecto-patentia, supra basin recurva, patentissima, loriformia, obtusangule canaliculata, lateribus

leviter convexa, basi conduplicato-canaliculata, apice oblique obtusa, oblique biloba vel oblique truncata, irregulariter dentata, dentibus exterioribus et intermedio saepe productis, costa media supra sulcata subtus carinata, firmiter coriacea, opaca, dilutius viridia, c. 30—34.5 cm longa, 4—5 cm lata; vaginae tubulosae, apice antice rumpentes, internodia bene superantes. Inflorescentiae validae, laxae pauci-pluriflorae, pedunculo subtereti, 3.5 cm superante, bene 0.6 cm diam., rachide quaquaverse flexuosa, angulata, c. 9.5 cm longa. Bracteae adpressae, triangulae, obtusae, concavae, dorso c. 0.7 cm longae. Flores c. 6 vel plures, magni, carnosii, sepalis petalisque reflexis. Sepalum dorsale ex ungue quadrato convexo in laminam ovato-orbicularem concavam margine et fascia longitudinali mediana convexam dilatatum, explanatum c. 3.15 cm longum, ungue 0.75 cm longo, 0.8 cm lato, lamina 2.4 cm longa, 2.5 cm lata. Sepala lateralia obliqua, ex ungue subquadrato in laminam oblique abbreviato-ovato-rhombeam rotundatam dilatata, convexa, explanata tota c. 3.15 cm longa, ungue c. 0.6 cm longo, medio 0.8 cm lato, lamina 2.35 cm longa, 2.7 cm lata. Petala subfalcata, ex ungue oblongo-lineari convexo in laminam oblique subovato-orbicularem rotundatam magnam partem concavam dilatata, tota c. 3.3 cm longa, ungue c. 1.1 cm longo, medio 0.5 cm lato, lamina c. 2.2 cm longa et lata. Labellum porrectum, 3-lobum, calcaratum, pulvinis 2 convexis papillois basi in pariete postico in fauce calcaris, callo transverso bilobulo inter lobos laterales infra basin lobi intermedii, totum c. 3.3 cm longum; lobi laterales parvi, sub gynostemio porrecti, inferne subverticales, margine inferiore incurvi et angulo inferiore antico contigui, rotundato-quadrati, extus convexi, intus leviter concavi, c. 0.6 cm longi; lobus intermedius magnus, mobilis, porrectus, hastatus, convexus, costis 3 parallelis longitudinalibus subconspicuis inter lobulos basiliares, explanatus c. 2.6 cm longus, ad lobulos basiliares bene 2 cm, ad constrictionem 1.2 cm latus, lobulis basiliaribus subreversis, patentibus, basi convexis, apice incurvulis, oblique triangulis vel potius subquadrangulis, satis acutis, c. 0.5 cm longis, lobulo intermedio sinibus rotundatis a lobulis basiliaribus separato, abbreviato-ovato, apice late emarginato breviter rotundato-bilobo, convexo vel marginibus lateralibus revolutis subtubuloso, explanato c. 1.6 cm longo, 2.1 cm lato; calcar reversum, valde lateraliter compressum, oblique oblongum, obtusum, c. 0.8 cm longum, 0.44 cm altum. Gynostemium breve, basi utrinque valde dilatatum, supra visum trilobum, apice truncatum, absque anthera c. 0.9 cm longum, 1.6 cm latum, clinandrio reniformi, vix concavo cum costa longitudinali. Anthera cucullata, ambitu quinquangularis, basi truncata cum gibbero parvo, apice in rostrum latum rotundatum convexum contracta, c. 0.55 cm lata. Pollinia 2, a dorso compressa, oblique subovato-quadrangula, apice rotundata, dorso alte fissa, cum stipite lato apice breviter acuminato et convexo et glandula magna ovato-orbiculari c. 0.625 cm longa. Rostellum brevissimum, emarginatum. Stigma parvum, transverse fissuriforme. Ovarium valde 6-costatum et obtusangule 6-canaliculatum, c. 0.9 cm longum; pedicellus 6-angulatus, 6-costatus, c. 6 cm longus.

Sumatra: Agam, near Fort de Kock, 900 m. (*R. Schlechter n. 15962!*, January 1907; *W. Groeneveldt*, cult. in Hort. *E. Jacobson* sub *n. 1765*). Lampong. (Cult. in Hort. *J. H. de Voogt*, Batavia, 1918).

Geographical distribution: Endemic.

The affinity of this species is with *V. helvola* Bl., and, in less degree, with *V. Dearei* Rehb.f., not with *V. limbata* Bl., as Schlechter suggests.

There are 3 ridges on the midlobe of the lip and a transverse callus near the base of the midlobe.

From a fresh specimen, native of the Padang Highlands, sent by Dr Jacobson, I made the following annotations: Sepals and petals on the innerside slightly glittering, light chocolate or liverbrown, on the lamina with dark brown reticulations, on the claw with ditto dots, in the central portion with light dirty-yellow specks, the brown, especially on the petals, confluent to a broad margin, all of them bordered with a narrow light yellow edge, at the back dead light yellow, on the margin and midrib marked brown. Lip at the base between the sidelobes white with two small lemon-yellow spots, the sidelobes white, midlobe lemon-yellow tinged with light brown, especially on the frontlobe, towards the base with four longitudinal interrupted purplish brown stripelets, spur white, column pure white, lemon-yellow at the top, at the base separated from the lip by a transverse dark purple line. Ovary and pedicel white.

On a raceme received from Mrs. Scheffer at Mr. Cornelis the sepals and petals showed auburn reticulations on a yellow ground, whereas the lip was yellow.

The flowers exhale at daytime a strong rather disagreeable odour, subject, however, to variation. In a specimen hailing from the Padang Highlands it may be pretty well compared with a mixture of sweet and carbolie, in another specimen cinnamon was more suggestive, in a third carbolie.

From fresh flowers from a plant originating from Southern Sumatra, for which I am indebted to Mr J. G. H. de Voogt, I noted that the odour seemed to be a mixture of lemon, cinnamon and some cimicide. After the flower was left some time in a glass box the odour was purely that of a lemon, but it changed again when the flower was taken out of the box.

Description from a cultivated specimen and materials preserved in alcohol.

Vanda (sect. *Deltalobos*) **hastifera** Rehb. f. in Linnaea (1876), 30; J. J. S. Ic. Orch. Mal. II (1938), t. 124, III; F. J. Paath in de Orchidee IV (1935), 209, with photo.

Caulis elongatus, parce ramosus, radicans, teres, avellaneus, c. 80 cm longus, 0.75—0.85 cm diam., internodiis c. 1.5 cm longis. Folia patentia, recurva, loriformia, praesertim inferne canaliculata, superne utroque latere supra leviter convexa, apice valde oblique bilobulata, lobulis triangulis plerumque acutis pungentibus plus minusve irregulariter marginatis, mucrone valde brevior lobulo majori adnato interposito, costa media supra sulcata subtus leviter prominente, firmiter coriacea, vix nitidula, viridia, parte soli exposita plus minusve sordide violaceo-punctata, c. 17—26 cm longa, 2.2—2.6 cm lata; vaginae tubulosae, deinde antice rumpentes, virides, internodia superantes. Inflorescentiae axillares, foliis multo breviores, 3—5-florae, pedunculo c. 1.5—2.5 cm longo, diluta viridi, rachide flexuosa, angulata, dilute viridi, c. 2.5—4 cm longa. Bracteae adpressae, rotundato-triangularae, pallide virides, c. 0.5 cm longae. Flores patentes, mediocres, odorem corticis cinnamomi exhalantes, diu viriditatem conservantes, carnosi,

c. 3.5 cm lati, 4.75 cm longi, sepalis petalisque semireflexis, undulatis, pal-
lide flavescentibus dorso margine excepto confluerent castaneo-maculatis,
intus inferne parce superne confluerent cinnamomee maculatis, sepalis
lateralibus copiose maculatis. Sepalum dorsale oblongum, obtusum, basi
unguiculato-contractum, totum c. 2.2—2.8 cm longum, 0.9—1 cm latum, ungue
convexo 0.5—0.65 cm longo. Sepala lateralia oblique spathulato-oblonga,
costa media dorso obtuse prominente, c. 2.1—2.4 cm longa, lamina plus
minusve ovata, obtusa, c. 1.6—1.9 cm longa, 1.25—1.3 cm lata, ungue con-
vexo, c. 0.5 cm longo, 0.55 cm lato. Petala oblique spathulata, c. 2.1—
2.5 cm longa, lamina oblique subovata, obtusa, c. 1.2 cm lata, ungue convexo,
0.75—1 cm longo. Labellum horizontale, 3-lobum, calcaratum, c. 1.9 cm
longum; lobi laterales sub gynostemio porrecti, paralleli, conspicui, oblique
ovati, apice recurvuli, obtusi, concavi, albi, intus striis c. 5 longitudinalibus
punctorum flavorum ad flavo-brunneorum notati, c. 0.7—0.85 cm longi,
0.45—0.5 cm lati; lobus intermedius porrectus, crasse carnosus, inferne
subtus triangulo-concavus, hastatus, medio vel paulum supra medium obtus-
angule incurvus, lobulis basilaribus divaricatis triangulis acutis, apice angu-
lato-rotundato-dilatatus, rotundato-bilobulus, lobulis intus in callum conspi-
cium trigono-conicum obtusum nitidum flavescenti-album incrassatis, 3-cos-
tatus, costis exterioribus e callis decurrentibus inferne evanescentibus, costa
media e basi usque ad apicem producta, glabra, apice dilatato et costa media
exceptis supra villosus, supra albus, apicem versus inter costas brunnescens,
inferne striis 2 castaneis, subtus basi excepta nitide castaneus, c. 1.2 cm
longus, basi 0.95 cm, medio 0.4 cm, apice 0.6—0.7 cm latus; calcar reversum,
ovario parallelum, cum labello angulum obtusum faciens, rectum, conicum,
a latere compressum, cinnamomeum, c. 5 cm longum, incrassationibus 2 con-
vexis sulco alto separatis albis pubescentibus in faucis pariete postico. Gyno-
stemium rectum, longiusculum, tenuiusculum, leviter clavatum, basi conspice
6-angulato-disciformi-dilatatum, flavescenti-album, basi dilute brunneo-macu-
latum, parte dilatata castaneum, c. 0.85 cm longum, basi 0.75 cm latum,
clinandrio ovali concavo cum costa longitudinali. Anthera cucullata, angu-
lato-orbicularis, apice late obtuse triangulo-producta, flavescenti-alba, inter-
dum striis 2 longitudinalibus castaneis notata, c. 2.7—0.325 cm lata, con-
nectivo longitudinaliter costulata. Pollinia 2, a latere fissa, ovalia, a dorso
compressa, flava, cum stipite lato albo et glandula magna suborbiculari
alba bene 0.3 cm longa. Rostellum late obtuse bilobulum. Stigma alte ex-
cavatum, transverse quadrangulum. Ovarium trigonum, 6-suleatum, sulcis
in lateribus geminatis, flavescenti-album, cum pedicello c. 5.5—6 cm longum.

Borneo: Western part, Pontianak. (Cult. in *Hort. Bog.*). Tajan, along S. Tjem-
pede. (*J. P. Schuitemaker*, May 1931). Melia, along S. Boeajan. (*J. P. Schuitemaker*).
Sarawak: Bangan Ayer. (*I. F. Förstermann*, cult. in *Hort. J. and L. Linden*,
Brussels).

Geographical distribution: Endemic.

The nearest allies of this species are *V. Lindeni* Rehb.f., *V. celebica*
Rolfe, *V. crassiloba* T. et B., *V. Gibbsiae* Rolfe and *V. saxatilis* J. J. S.,
on which R. Schlechter based his section *Deltalobos*. In the form of the
lip it much resembles *V. celebica*, but the lateral sepals are not deflexed,
the apical tumors of the lip much larger, the colour of the flowers very
different, the leaves narrower, and the racemes few-flowered. From

V. Gibbsiae, which is also a native of Borneo, it differs according to the description considerably in the form of the lip.

Description from cultivated specimens.

Arachnis celebica J. J. S. in Nat. Tijdschr. Ned. Ind. LXXII (1912), 74. — *Vandopsis celebica* Schltr. in Fedde Rep. X (1911), 195; Beih. LXXIV (1934), t. 75, Nr. 297.

Caulis rigidus, compressus, subflexuosus, nitide viridis, omnino vaginis foliorum tectus, internodiis sectione transversa ovalibus, ad nodos incrassatis, ad c. 3 cm longis, 0.7 cm diam., radicibus rigidis, crassis, teretibus, c. 0.63 cm longis. Folia alternatim bifaria, patentissima, oblonga, apice lato breviter et paulo inaequaliter rotundato-biloba, laxe subundulata, margine acuta recurvaque, costa media supra tenuiter sulcata subtus ad basin sulcata apice prominula, firmiter coriacea, nitide viridia, c. 12—13 cm longa, 4.2—3.6 cm lata; vaginae tubulosae, internodia superantes, c. 1.1 cm diam. Inflorescentiae vaginam dorso ad basin perforantes, vaginam inferiorem apice rumpentes, laxe c. 3-florae, pedunculo brevi, valido, compresso, c. 3.5 cm longo, vaginulis brevibus, tubulosis, rachide flexuosa, c. 3.8 cm longa, viridi, internodiis ad c. 2.2 cm longis. Bractee breviter tubulosae, rotundatae, membranaceae, ad c. 0.6 cm longae. Flores patentes, mediocres, carnosius, 5 cm lati, sepalis petalisque patentissimis, spathulatis, ungue excepto bene undulatis, flavescentibus, castanea pantherino-maculatis, dorso flavescenti-albis minute castaneae maculatis. Sepalum dorsale 2.75 cm longum, ungue oblongo, superne paulo dilatato, intus plano, dorso convexo, c. 1 cm longo, 0.65 cm lato, lamina ovata, truncato-rotundata, c. 1.75 cm longa, 1.55 cm lata. Sepala lateralia inter se angulum rectum facientia, falcato-obliqua, dorso bene obtuse carinata, c. 2.5 cm longa, ungue concavo, superne paulo dilatato, c. 0.7 cm longo, bene 0.6 cm lato, lamina late ovata, rotundata, c. 1.9 cm longa, 1.6 cm lata. Petala falcato-obliqua, c. 2.6 cm longa, ungue lineari-oblongo, superne paulo dilatato, dorso obtuse carinato, c. 1.25 cm longo, superne 0.5 cm lato, lamina breviter oblique ovata, rotundata, marginibus valde incurvis, dorso medio incrassata, c. 1.35 cm longa, 1.4 cm lata. Labellum minutum, ungue tenui valde elastice affixum, porrectum, a latere compressum, saccatum, 3-lobum, carnosum, subtus rotundatum, gynostemium vix superans, totum 0.95 cm longum, ad lobos laterales 0.8 cm altum; lobi laterales erecti, margine antico divergentes, breves, lati, angulati, albi, intus longitudinaliter purpureo-striati, superne pallidiores et aurantiaco-suffusi; discus inter lobos laterales convexo-incrassatus, purpureo-punctatus, inferne maculis 2 flavo-aurantiacis ornatus, ad basin carinae puberulus; lobe intermedius erectus, incurvulus, lineari-subulatus, purpurascens, albus, purpurascens-punctatus, c. 0.65 cm longus, dimidio inferiore fere carina valida in saccum decurrente a latere compressa lobulum rotundatum formante, postice irregulariter crenata purpurascens marginem versus albida instructus. Gynostemium crassum, curvatum, a dorso compressum, dorso convexum, albidum, dorso purpureo-punctatum, subtus flavo-suffusum longitudinaliter purpureo-striatum, c. 1 cm longum, apice truncatum, clinandrium transversum, concavum, pede abbreviatio subexciso-truncato. Anthera cucullata, ambitu transverse elliptica vel melius late triangula apice in rostrum breve obtuse triangulum producta, basi bilobula, alba, c. 0.45 cm lata, thecis incrassatis rugulosis verrucosis basin versus papil-

losis medio excavatione oblique oblongo-elliptica instructis. Pollinia 4, geminata, a dorso compressa, extus convexa, intus concava, dilutius flava, 2 antica majora et late pyriformia, 2 postica minora rotundato-quadrangula, cum stipite lato hyalino superne postice conduplicato-contracto apice libero obtuso et glandula lata transverse subelliptica utrinque in denticulum acutum producta c. 0.3 cm longa. Rostellum latum, obtuse bilobulum. Stigma quadrangulum, basin versus dilatatum et bilobulum. Ovarium sessile, 6-sulcatum, virescenti-album, c. 2.1 cm longum.

Central Celebes: Rante Pau, c. 800 m. (Cult. in Hort. J. van Brero, Bandoeng).

North Celebes: Minahassa, near Lansot, c. 700 m. (E. Schlechter n. 20633, December 1909).

Geographical distribution: Endemic.

This plant is, as I have pointed out before, no *Vandopsis* but a true *Arachnis*. My description differs slightly from that given by Dr Schlechter. I have given a fresh one because many details are omitted in his description.

The species is a very near ally of *A. breviscapa* J. J. S. from Borneo and fresh flowers of the latter should be compared with it.

Description from fresh material.

Trichoglottis cochlearis Rehb. f. in Gard. Chr. n. s. XIX (1883), I, 142.

Caulis subteres, c. 12.5 cm longus. Folia subpatentissima, recurvula, lineari-loriformia, apice angustata, inaequaliter acute bidentata, obtusangule canaliculata, costa media supra sulcata subtus obtuse prominente, leviter transverse rugosa, crasse carnosae, rigida, nitidule viridia, subtus paulo pallidiora, c. 5.5—12 cm longa, inexplanata 0.95—1 cm lata; vaginae breviter tubulosae, sectione transversa ellipticae, valde transverse rugosae, c. 0.6 cm latae. Inflorescentiae axillares, vaginam dorso ad basin perforantes, laxae c. 3-florae, pedunculo pallide viridi, purpureo-suffuso, c. 2.1 cm longo, basi nonnullis vaginulis majusculis late tubulosis lateraliter compressis obtusis donato, rachide flexuosa, facie florem versus spectante applanata, colore pedunculi, c. 1.8 cm longa, internodiis ad c. 0.9 cm longis. Bractae parvae, adpressae, triangulae, acutae. Flores majusculi, carnosae, valde dulces sed ingrato-odorati, c. 2.3 cm lati, sepalis petalisque albis, intus striis paucis transversis angustis violaceo-purpureis notatis. Sepalum dorsale incurvum ex ungue quadrangulo c. 0.325 cm longo 0.3 cm lato in laminam ovatam obtusam c. 1.1 cm longum 0.8 cm latam dilatatum, marginibus recurvis valde convexum. Sepala lateralia supra basin incurva, ex ungue c. 0.2 cm longo 0.275 cm lato in laminam oblique ovatam obtusam apice purpureo-maculatam c. 1.4 cm longam fere 1 cm latam dilatata, convexa, dorso crasse carinata. Petala oblique anguste spathulata, basi incurvula, obtusa, valde convexa, c. 1.25 cm longa, ungue c. 0.15 cm, lamina fere 0.4 cm lata. Labellum 3-lobum, calcaratum, basi pedi gynostemii breviter adnatum, album, usque ad apicem ovarii c. 1.15 cm, cum calcaribus c. 1.4 cm longum; lobi laterales erecti, infra gynostemium porrecti, parte libera trianguli, obtusi, margina antice incurvi et basi contigui, intus convexo-incrassati, violaceo-purpureo-marginati, margine antice basi flavo, gynostemium superantes; lobus intermedius porrectus, crassissime carnosus, concavus, dorso convexus, transverse ovalis, apice subtruncatus, utroque latere angulatus, callo transverso carnosio postice rotundato-bilobo papilloso excavationem

limitante ad basin, medio flavescenti-albus, maculis transversis purpurascens notatus, inexplanatus c. 0.675 cm longus, 0.9 cm latus; calcar reversum, rectum, conicum, anguste obtusum, leviter a latere compressum, basi utrinque leviter convexo-inflatum, intus pubescens, c. 0.6 cm longum, lamella horizontali ovato-triangulari obtusa subtus pilosa e pariete postico inter lobos laterales faucem obtegente. Gynostemium breve, latum, dorso excavatum, papillosum, album, late purpureo-marginatum, c. 0.3 cm longum, 0.37 cm latum, clinandrio leviter concavo, apice truncato, auriculis angulatis penicillatis. Anthera cucullata, supra visa transverse ovalis, basi late retusa, apice in rostrum recurvum triangulum acutum supra carinatum producta, crista transversa truncata retusa vel vix tridentata in dorso medium thecarum attingente, c. 0.3 cm lata. Pollinia 4, corpuscula 2 globosa formantia, postica quam antica multo minora, cum stipite sigmoideo rhombeo utrinque obtuso et glandula anguste oblonga supra carinata postice 2-dentata c. 0.3 cm longa. Rostellum antice et postice bidentatum. Stigma magnum, alte excavatum, suborbiculare. Ovarium trigonum, 6-sulcatum, album, inferne virescens, cum pedicello tortum, c. 1.25 cm longum.

Sumatra. (*W. Micholitz*). Padangsche Bovenlanden, Laras Talang, G. Talang, 1800 m, forest. (*H. A. B. Bunnemeijer* n. 5318, October 1918). Boekit Gombak, 1600 m, forest. (*H. A. B. Bunnemeijer* n. 5438, November 1918). Goenoeng Singalang, 1800—2000 m. (*E. Jacobson* cult. sub n. 1279—1282).

Geographical distribution: Endemic.

The species was first described by Reichenbach from plants introduced in the nurseries of James Veitch and Sons in London, probably by W. Micholitz. The description of Reichenbach suits Dr Jacobson's plant rather good, only the lamella covering the mouth of the spur is not 2—3-dentate.

It is a pretty species allied to *T. pusilla* Rehb.f. from Java but larger. The odour of the flowers is very strong and sweet, but not agreeable.

Description from a living specimen sent by Dr Jacobson. The plant was kept in Buitenzorg for a considerable time, but as it did not flower, it was removed to the mountain gardens in Tjibodas, from where I soon received a flowering stem.

Malleola batakensis Schltr. Orch. D. N. Guinea (1913), 981; in Fedde Rep. Beih. LXXIV (1934), t. 76, Nr. 302. — *Saccolabium batakense* Schltr. in Fedde Rep. XI (1912), 144.

Planta pusilla, caule interdum ramosa, tenui, flexuoso, basi radicante, c. 4—6.5 cm longo, internodiis c. 0.45—0.5 cm longis. Folia subpatentissima, oblique lineari-lanceolata, saepe plus minusve falcata, apicem versus angustata, bene inaequaliter obtuse bilobula, basi angustata breviter conduplicata, costa media subtus prominente, c. 2.4—5 cm longa, 0.4—0.7 cm lata; vaginae tubulosae, internodia aequantes, postice anticeque carinatae, nervis sicco prominentibus, apice antice excisae. Inflorescentiae vaginam dorso ad basin perforantes, simplices, laxe pluriflorae, pedunculo tenui, c. 0.15—1.8 cm longo, nonnullis vaginulis tubulosis donato, rachide angulata, c. 3—3.5 cm longa. Bractae parvae, incurvae, subulatae, concavae. Flores quaquaversi, parvi, macerati c. 0.36 cm longi. Sepalum dorsale erectum, incurvum, valde concavum, explanatum oblongo-ovale, rotundato-obtusum, c. 0.2 cm longum, fere 0.1 cm latum. Sepala lateralia incurvula, oblique subspathulato-oblonga, obtusa, c. 0.18 cm longa, 0.075—0.08 cm lata. Petala incurvula, oblique

oblonga, subfalcatula, obtusa, c. 0.15 cm longa, 0.075 cm lata. Labellum basi gynostemio (pedi gynostemii) breviter adnatum, 3-lobum, calcaratum, totum c. 0.26 cm longum; lobi laterales ad faucem calcaris erecti, humiles, brevissime obtusangule trianguli, basi lati; lobus intermedius parvus, porrectus, revolutus, e basi breviter dilatata subulatus, acutissimus, ecallosus, fere 0.05 cm longus; calcar conspicuum, reversum, dorso subrectum, dimidio inferiore fere oblique infundibuliforme, medio leviter constrictum, parte superiore a dorso compressum, obtuso-rotundatum, c. 0.225 cm longum, basi 0.125 cm, superne 0.1 cm latum. Gynostemium brevissimum, supra basin obtusangule recurvum, breviter malleiforme, dorso convexum, c. 0.075 cm longum, clinandrio transverse ovali, non excavato, callis 2 oblique obtuse conicis donato, auriculis porrectis, triangulo-dentiformibus, acutis. Anthera cucullata, e basi transverse aequilateraliter trapeziformi basi retuso-bilobula in rostrum conspicuum late triangulum subtruncato-obtusum producta, ambitu quinquangularis, 0.08 cm lata. Pollinia 2, divaricata, ovalia, stipite spathulato, convexo, parte dilatata apice bibrachiato-dilatato, brachiis recurvis convexis explanatis divaricatis triangulis obtusis, glandula parva, oblonga, pollinarium totum fere 0.1 cm longum. Rostellum breve. Stigma altius excavatum, subtrilobulum. Ovarium 6-suleatum, cum pedicello brevi 0.2 cm longum, calcar brevius.

Sumatra: Deli, Batak mountains above Lau Boentoe, c. 400 m. (*R. Schlechter* n. 20726, April 1910). Betimoes valley, west of Sibolangit, 500 m, in forest on thin branches of *Stelechocarpus*, rather common on the spot. (*J. A. Lörzing* n. 5589, March 1918: "flowers yellow, spur and ovary very light green").

Geographical distribution: Endemic.

A species in the way of *M. sphingoides* J. J. S., *M. insectifera* J. J. S. from Java etc.

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to Vol. V

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(Synonyms in *italics*, new names in heavy type).

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